PHILIPS

Data handbook

Electronic components and materials

Semiconductors

Book S10 1985

Wideband transistors and Wideband hybrid IC modules

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WIDEBAND TRANSISTORS AND WIDEBAND HYBRID IC MODULES

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DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of four series of handbooks:

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

The contents of each series are listed on pages iv to viii.

The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

When ratings or specifications differ from those published in the preceding edition they are indicated with arrows in the page margin. Where application information is given it is advisory and does not form part of the product specification.

Condensed data on the preferred products of Philips Electronic Components and Materials Division is given in our Preferred Type Range catalogue (issued annually).

Information on current Data Handbooks and on how to obtain a subscription for future issues is available from any of the Organizations listed on the back cover.
Product specialists are at your service and enquiries will be answered promptly.

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks comprises:

T1 **Tubes for r.f. heating**

T2a **Transmitting tubes for communications, glass types**

T2b **Transmitting tubes for communications, ceramic types**

T3 **Klystrons**

T4 **Magnetrons for microwave heating**

T5 **Cathode-ray tubes**
Instrument tubes, monitor and display tubes, C.R. tubes for special applications

T6 **Geiger-Müller tubes**

T7 **Gas-filled tubes** (will not be reprinted)

T8 **Colour display systems**
Colour TV picture tubes, colour data graphic display tube assemblies, deflection units

T9 **Photo and electron multipliers**

T10 **Plumbicon camera tubes and accessories**

T11 **Microwave semiconductors and components**

T12 **Vidicon and Newvicon camera tubes**

T13 **Image intensifiers**

T14 **Infrared detectors**

T15 **Dry reed switches**

Data collations on these subjects are available now.
Data Handbooks will be published in 1985.

T16 **Monochrome tubes and deflection units**
Black and white TV picture tubes, monochrome data graphic display tubes, deflection units

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks comprises:

S1 **Diodes**
Small-signal germanium diodes, small-signal silicon diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes

S2a **Power diodes**

S2b **Thyristors and triacs**

S3 **Small-signal transistors**

S4a **Low-frequency power transistors and hybrid modules**

S4b **High-voltage and switching power transistors**

S5 **Field-effect transistors**

S6 **R.F. power transistors and modules**

S7 **Surface mounted semiconductors**

S8 **Devices for optoelectronics**
Photosensitive diodes and transistors, light-emitting diodes, displays, photocouplers, infrared sensitive devices, photoconductive devices.

S9 **Power MOS transistors**

S10 **Wideband transistors and wideband hybrid IC modules**

S11 **Microwave semiconductors**

S12 **Surface acoustic wave devices**

INTEGRATED CIRCUITS (PURPLE SERIES)

The purple series of data handbooks comprises:

EXISTING SERIES		Superseded by:
IC1	**Bipolar ICs for radio and audio equipment**	IC01N
IC2	**Bipolar ICs for video equipment**	IC02Na and IC02Nb
IC3	**ICs for digital systems in radio, audio and video equipment**	IC01N, IC02Na and IC02Nb
IC4	**Digital integrated circuits** CMOS HE4000B family	
IC5	**Digital integrated circuits – ECL** ECL10 000 (GX family), ECL100 000 (HX family), dedicated designs	IC08N
IC6	**Professional analogue integrated circuits**	
IC7	**Signetics bipolar memories**	
IC8	**Signetics analogue circuits**	IC11N
IC9	**Signetics TTL logic**	IC09N and IC15N
IC10	**Signetics Integrated Fuse Logic (IFL)**	IC13N
IC11	**Microprocessors, microcomputers and peripheral circuitry**	

NEW SERIES

IC01N	**Radio, audio and associated systems** Bipolar, MOS	(published 1985)
IC02Na	**Video and associated systems** Bipolar, MOS Types MAB8031AH to TDA1524A	(published 1985)
IC02Nb	**Video and associated systems** Bipolar, MOS Types TDA2501 to TEA1002	(published 1985)
IC03N	**Integrated circuits for telephony**	(published 1985)
IC04N	**HE4000B logic family** CMOS	
IC05N	**HE4000B logic family — uncased ICs** CMOS	(published 1984)
IC06N	**High-speed CMOS; PC54/74HC/HCT/HCU** Logic family	(published 1985)
IC07N	**High-speed CMOS; PC54/74HC/HCT/HCU — uncased ICs** Logic family	
IC08N	**ECL 10K and 100K logic families**	(published 1984)
IC09N	**TTL logic series**	(published 1984)
IC10N	**Memories** MOS, TTL, ECL	
IC11N	**Linear LSI**	(published 1985)
IC12N	**Semi-custom gate arrays & cell libraries** ISL, ECL, CMOS	
IC13N	**Semi-custom** Integrated Fuse Logic	(published 1985)
IC14N	**Microprocessors, microcontrollers & peripherals** Bipolar, MOS	
IC15N	**FAST TTL logic series**	(published 1984)

Note

Books available in the new series are shown with their date of publication.

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks comprises:

C1 **Programmable controller modules**
PLC modules, PC20 modules

C2 **Television tuners, coaxial aerial input assemblies, surface acoustic wave filters**

C3 **Loudspeakers**

C4 **Ferroxcube potcores, square cores and cross cores**

C5 **Ferroxcube for power, audio/video and accelerators**

C6 **Synchronous motors and gearboxes**

C7 **Variable capacitors**

C8 **Variable mains transformers**

C9 **Piezoelectric quartz devices**

C10 **Connectors**

C11 **Non-linear resistors**
Voltage dependent resistors (VDR), light dependent resistors (LDR), negative temperature coefficient thermistors (NTC), positive temperature coefficient thermistors (PTC)

C12 **Potentiometers, encoders and switches**

C13 **Fixed resistors**

C14 **Electrolytic and solid capacitors**

C15 **Ceramic capacitors**

C16 **Permanent magnet materials**

C17 **Stepping motors and associated electronics**

C18 **Direct current motors**

C19 **Piezoelectric ceramics**

C20 **Wire-wound components for TVs and monitors**

C21* **Assemblies for industrial use**
HNIL FZ/30 series, NORbits 60-, 61-, 90-series, input devices

C22 **Film capacitors**

* Will be issued in 1985.

SELECTION GUIDE

This table shows the most preferred types of n-p-n transistors and their complements for wideband applications. It shows the types *in sequence of linear output voltage* capability in each type of envelope. The values of V_o, ITO and PL1 are only given as a typical reference.

For detailed information see relevant data sheet.

Wideband transistors (f_T = 5 GHz)

			I_C (mA) V_{CE} (V)		14 10	30 8	70 10	80 10	90 10	120 15	240 15	600 18
	polarity		V_o* (mV)		150	425	700		1000	1200	1600	2200
			ITO (dBm)		27	36	40			45	47	
envelope	n-p-n	p-n-p	PL1 (dBm)		8	17	21			26	28	
SOT-37	•			BFT24	BFR90A	BFR91A	BFR96S		BFQ34T			
		•			BFQ51	BFQ23	BFQ32S					
SOT-23**	•			BFT25	BFR92A	BFR93A						
		•			BFT92	BFT93						
SOT-89	•						BFQ19	BFQ18A				
SOT-122	•									BFQ34	BFQ68	BFQ136
SOT-103	•				BFG90A	BFG91A	BFG96		BFG34			
SOT-173	•				BFP90A	BFP91A	BFP96					
TO-72	•				BFQ53	BFQ22S	BFQ63					
		•			BFQ52	BFQ24						

Wideband transistors (f_T = 7,5 GHz)

			I_C (mA) V_{CE} (V)		15 8				
SOT-37	•				BFQ65				
SOT-23**	•				BFQ67				
SOT-103	•				BFG65				
SOT-143**	•				BFG67				
SOT-173	•				BFQ66				

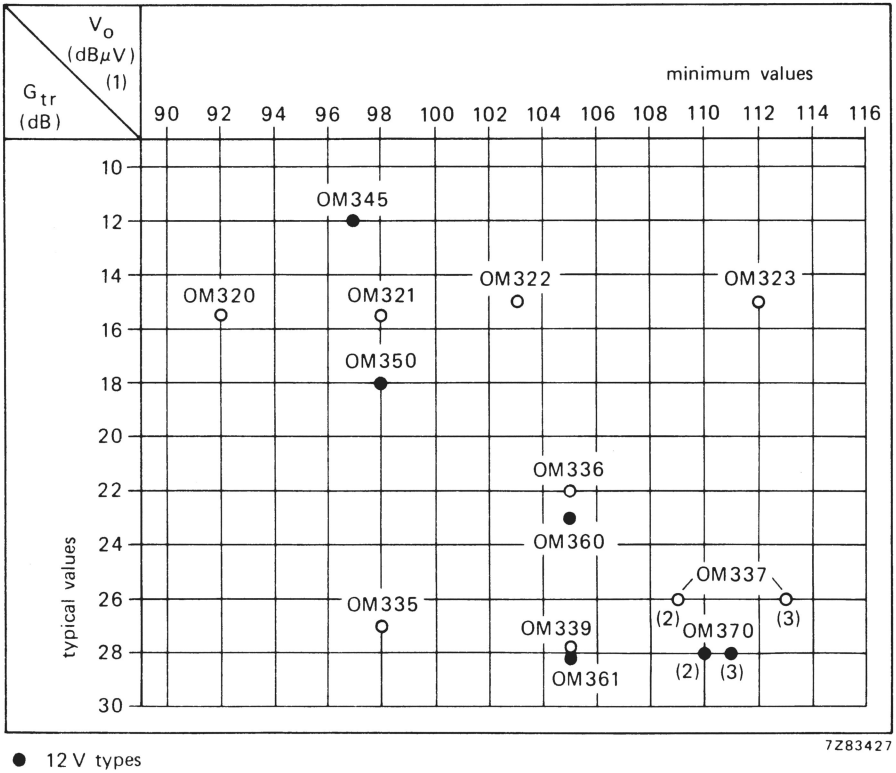
* Typical output voltage at d_{im} = –60 dB (DIN45004B, par. 6.3: 3-tone).

** See Handbook Surface Mounted Semiconductors.

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY61	5 - 200	13,0 ± 0,5	reverse amplifiers	461
BGY65		18,5 ± 0,5		465
BGY67		22,5 ± 0,5		469
BGY67A		24,0 ± 0,5		473
BGY50	40 - 300	12,5 ± 0,4	preamplifier	429
BGY51			post amplifier	429
BGY52	40 - 300	16,4 ± 0,4	preamplifier	433
BGY53			post amplifier	433
BGY54	40 - 300	17,0 ± 0,4	preamplifier	437
BGY55			post amplifier	437
BGY56	40 - 300	22,0 ± 0,6	preamplifier	441
BGY57			post amplifier	441
BGY58	40 - 300	33,0 ± 1,0	line extender	445
BGY58A	40 - 300	34,0 ± 1,0	line extender	449
BGY59	40 - 300	38,5 ± 1,0	line extender	453
BGY60	40 - 300	33,5 ± 1,0	interstage amplifier (2 x 17 dB)	457
BGD102	40 - 450	18,5 ± 0,5	power doubler	421
BGD104		20,0 ± 0,5	amplifiers	421
BGD102E	40 - 450	18,5 ± 0,5	power doubler	425
BGD104E		20,0 ± 0,5	amplifiers	425
BGY70	40 - 450	12,5 ± 0,4	preamplifier	477
BGY71			post amplifier	477
BGY74	40 - 450	17,0 ± 0,4	preamplifier	481
BGY75			post amplifier	481
BGY78	40 - 450	34,0 ± 1,0	line extender	485
BGY84	40 - 450	17,0 ± 0,5	preamplifier	489
BGY85			post amplifier	489
BGY84A	40 - 450	18,4 ± 0,4	preamplifier	493
BGY85A			post amplifier	493

All modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

HYBRID ICs FOR WIDE-BAND AMPLIFIERS



● 12 V types

○ 24 V types

(1) At −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone).

(2) UHF.

(3) VHF.

Fig. 1 Type/performance in matrix survey.

The matrix survey (Fig. 1) and the tables next page show both the 12 V and 24 V ranges.

Note that the modules are available in the combination of high gain- high output voltage.

12 V supply voltage

	type	stages	gain (dB)	$V_{o(rms)}$ (dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2) input	max. VSWR typ. values (note 2) output	supply current (mA)	page
low	OM345	1	12	97	5,5	2,0	1,4	11,5	547
medium	OM350	2	18	98	6,0	1,5	1,9	18	553
medium	OM360	3	23	105	7,0	1,3	1,5	55	559
output	OM361	3	28	105	6,0	1,5	1,7	50	565
high output	OM370	3	28	111	7,0	2,3	1,9	105	571

24 V supply voltage

	type	stages	gain (dB)	$V_{o(rms)}$ (dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2) input	max. VSWR typ. values (note 2) output	supply current (mA)	page
low output	OM320	2	15,5	92	5,5	2,2	2,5	33	501
	OM321	2	15,5	98	6,0	2,5	2,0	33	507
	OM335	3	27	98	5,5	1,9	3,2	35	525
medium output	OM322	2	15	103	7,0	1,7	1,7	60	513
	OM336	3	22	105	7,0	1,4	1,6	65	531
	OM339	3	28	105	6,0	1,5	1,5	66	543
high output	OM323*	2	15	112	9,0	1,9	2,3	100	519
	OM337*	3	26	113	9,8	2,3	1,8	115	535

* Also available in A-version for external coil and output capacitor.

Notes

1. Measured at −60 dB intermodulation distortion to DIN45004, par. 6.3: 3-tone, f = 470 MHz.
2. The typical maximum VSWR occurring in the frequency range 40-860 MHz, for a sample connected to a 75 Ω line.

TYPE NUMBER SURVEY

type number	n-p-n or p-n-p	envelope	RATINGS V_{CEO} V	I_C mA	P_{tot} mW	CHARACTERISTICS (typical values unless otherwise specified) f_T GHz	F at f dB	MHz	G_{UM} at f dB	MHz	V_o* mV	PL1** dBm	ITO** dBm	I_C mA	V_{CE} V	page
BF689K	n	TO-92	15	25	360	1,8	3	200	16	200						35
BF763	n	TO-92	15	25	500	1,8	5	800	—	—						37
BFG23	n	SOT-103	12	35	180	5	3,7	800	14,5	800	400			30	8	39
BFG32	n	SOT-103	12	75	700	4,5	4,3	800	13	800	500			70	10	45
BFG34	n	SOT-103	18	150	1000	3,7	2,3	800	14	800	750	22	41	90	10	51
BFG51	p	SOT-103	15	25	180	5	3,4	800	17	800	150			14	10	57
BFG65	n	SOT-103	10	300	300	7,5	3	2000	10,5	2000	—					65
BFG90A	n	SOT-103	15	25	180	5	2,4	800	19	800	150	8	27	14	10	71
BFG91A	n	SOT-103	12	35	300	6	2,3	800	17	800	425	17	36	30	8	79
BFG96	n	SOT-103	15	150	700	5			15	800	700	21	40	70	10	87
BFP90A	n	SOT-173	15	30	250	5	2,4	800	19	800						95
BFP91A	n	SOT-173	12	50	350	6	2,3	800	18	800						103
BFP96	n	SOT-173	15	100	500	4,5	2,5	800	15	800						109
BFQ22S	n	TO-72	12	35	150	5	1,9	500	16	500	300			30	5	115
BFQ23	p	SOT-37	12	35	180	5	2,4	500	16,5	500	300			30	5	119
BFQ23C	p	SOT-173	12	50	350	5	3,7	800	19	500						125
BFQ24	p	TO-72	12	35	150	5	2,4	500	15	500	300			30	5	133
BFQ32	p	SOT-173	15	75	500	4,2	3,75	500	14	500	500			50	10	127
BFQ32C	p	SOT-37	15	100	500	4,5	—	—	—	—						141
BFQ32S	p	SOT-37	15	100	700	4,5	—	—	—	—	600			70	10	149
BFQ33	n	SOT-100	7	20	140	12	2,5	2000	13	2000				14	5	155
BFQ34	n	SOT-122	18	150	2250	3,9	8	500	16,3	500	1200	26	45	120	15	161
BFQ34T	n	SOT-37	18	150	1000	3,7	—	—	20	300	750			90	10	171
BFQ51	p	SOT-37	15	25	180	5	2,7	500	19	500	150			14	10	181
BFQ51C	p	SOT-173	15	30	250	5	3,5	800	17	800						187

* Typical reference value at $d_{im} = -60$ dB.

** Typical reference values.

type number	n-p-n or p-n-p	envelope	RATINGS V_{CEO} V	I_C mA	P_{tot} mW	CHARACTERISTICS (typical values unless otherwise specified) f_T GHz	F at f dB	MHz	G_{UM} at f dB	MHz	V_o* mV	PL1** dBm	ITO** dBm	I_C mA	V_{CE} V	page
BFQ52	p	TO-72	15	25	150	5	2,7	500	19	500	150			14	10	195
BFQ53	n	TO-72	15	25	150	5	2,4	500	18	500	150			14	10	199
BFQ63	n	TO-72	15	75	250	4,5	<3,0	200	11,5	500	500			50	10	203
BFQ65	n	SOT-37	10	50	300	7,5	3	2000	8	2000						207
BFQ66	n	SOT-173	10	50	350	7,5	3	2000	12,5	2000						211
BFQ68	n	SOT-122	18	300	4500	4	–	–	13	800	1600	28	47	240	15	217
BFQ136	n	SOT-122	18	600	9000	4	–	–	12,5	800	2200			500	15	227
BFR49	n	SOT-100	15	25	180	5	2,5	1000	17	1000				14	10	235
BFR64	n	SOT-48	25	200	3500	1	6	200								241
BFR65	n	SOT-48	25	400	5000	>1	–	–								249
BFR90	n	SOT-37	15	25	180	5	2,4	500	19,5	500	150			14	10	257
BFR90A	n	SOT-37	15	25	180	5	1,8	800	20	500	150	8	27	14	10	265
BFR91	n	SOT-37	12	35	180	5	1,9	500	18	500	300			30	5	279
BFR91A	n	SOT-37	12	35	300	6	1,6	800	14	800	425	17	36	30	8	287
BFR94	n	SOT-48	25	150	3500	3,5	5	500	13,5	500	700			90	20	299
BFR95	n	TO-39	25	150	1500	3,5	9	200			1000			80	18	309
BFR96	n	SOT-37	15	75	500	5	3,3	500	15,2	500	500			50	10	313
BFR96S	n	SOT-37	15	100	700	5	4	800	11,5	800	700	21	40	70	10	321
BFT24	n	SOT-37	5	2,5	30	2,3	3,8	500	17	500						333
BFW16A	n	TO-39	25	150	1500	1,2	<6	200								341
BFW17A	n	TO-39	25	150	1500	1,1	–	–								351
BFW30	n	TO-72	10	50	250	1,6	<5	500			100			30	6	359
BFW92	n	SOT-37	15	25	190	1,6	4	500								365
BFW92A	n	SOT-37	15	25	200	2,8	2,5	800	13	800	150			14	10	373
BFW93	n	SOT-37	10	50	190	1,7	<5	500	10,5	800	100			30	5	377
BFX89	n	TO-72	15	25	200	1,2	3,3	200								387
BFY90	n	TO-72	15	25	200	1,4	2,5	200								399
2N918	n	TO-72	15	50	200	<0,9	<6	60	36	200						415

* Typical reference value at d_{im} = –60 dB.
** Typical reference values.

type	frequency range	power gain	page
	MHz	dB	
BGD102	40 - 450	18,5 ± 0,5	421
BGD102E	40 - 450	18,5 ± 0,5	425
BGD104	40 - 450	20,0 ± 0,5	421
BGD104E	40 - 450	20,0 ± 0,5	425
BGY50	40 - 300	12,5 ± 0,4	429
BGY51	40 - 300	12,5 ± 0,4	429
BGY52	40 - 300	16,4 ± 0,4	433
BGY53	40 - 300	16,4 ± 0,4	433
BGY54	40 - 300	17,0 ± 0,4	437
BGY55	40 - 300	17,0 ± 0,4	437
BGY56	40 - 300	22,0 ± 0,6	441
BGY57	40 - 300	22,0 ± 0,6	441
BGY58	40 - 300	33,0 ± 1,0	445
BGY58A	40 - 330	34,0 ± 1,0	449
BGY59	40 - 300	38,5 ± 1,0	453
BGY60	40 - 300	33,5 ± 1,0	457
BGY61	5 - 200	13,0 ± 0,5	461
BGY65	5 - 200	18,5 ± 0,5	465
BGY67	5 - 200	22,5 ± 0,5	469
BGY67A	5 - 200	24,0 ± 0,5	473
BGY70	40 - 450	12,5 ± 0,4	477
BGY71	40 - 450	12,5 ± 0,4	477
BGY74	40 - 450	17,0 ± 0,4	481
BGY75	40 - 450	17,0 ± 0,4	481
BGY78	40 - 450	34,0 ± 1,0	485
BGY84	40 - 450	17,0 ± 0,5	489
BGY84A	40 - 450	18,4 ± 0,4	493
BGY85	40 - 450	17,0 ± 0,5	489
BGY85A	40 - 450	18,4 ± 0,4	493

type	frequency range MHz	transducer gain dB	output voltage at d_{im} = −60 dB dBμV	supply voltage V	page
OM320	40 - 860	15,5	⩾ 92	24	501
OM321	40 - 860	15,5	⩾ 98	24	507
OM322	40 - 860	15	⩾ 103	24	513
OM323	40 - 860	15	⩾ 112	24	519
OM323A	40 - 860	15	⩾ 112	24	519
OM335	40 - 860	27	⩾ 98	24	525
OM336	40 - 860	22	⩾ 105	24	531
OM337	40 - 860	26	⩾ 113	24	535
OM337A	40 - 860	26	⩾ 113	24	535
OM339	40 - 860	28	⩾ 105	24	543
OM345	40 - 860	12	⩾ 97	12	547
OM350	40 - 860	18	⩾ 98	12	553
OM360	40 - 860	23	⩾ 105	12	559
OM361	40 - 860	28	⩾ 105	12	565
OM370	40 - 860	28	⩾ 111	12	571

GENERAL

Type designation
Rating systems
Letter symbols
s-parameters
Soldering recommendations
for SOT-37 and SOT-103
Soldering recommendations
for SOT-48 and SOT-122

PRO ELECTRON TYPE DESIGNATION CODE FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices – as opposed to integrated circuits –, multiples of such devices and semiconductor chips.

"Although not all type numbers accord with the Pro Electron system, the following explanation is given for the ones that do."

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
B. SILICON or other material with band gap of 1,0 to 1,3 eV.
C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).

SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

A. DIODE; signal, low power
B. DIODE; variable capacitance
C. TRANSISTOR; low power, audio frequency ($R_{th\ j\text{-}mb} > 15$ K/W)
D. TRANSISTOR; power, audio frequency ($R_{th\ j\text{-}mb} \leqslant 15$ K/W)
E. DIODE; tunnel
F. TRANSISTOR; low power, high frequency ($R_{th\ j\text{-}mb} > 15$ K/W)
G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
H. DIODE; magnetic sensitive
L. TRANSISTOR; power, high frequency ($R_{th\ j\text{-}mb} \leqslant 15$ K/W)
N. PHOTO-COUPLER
P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j\text{-}mb} > 15$ K/W)
S. TRANSISTOR; low power, switching ($R_{th\ j\text{-}mb} > 15$ K/W)
T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j\text{-}mb} \leqslant 15$ K/W)
U. TRANSISTOR; power, switching ($R_{th\ j\text{-}mb} \leqslant 15$ K/W)
X. DIODE: multiplier, e.g. varactor, step recovery
Y. DIODE; rectifying, booster
Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment.*
One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.*
This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*
   The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage
   A. 1% (according to IEC 63: series E96)
   B. 2% (according to IEC 63: series E48)
   C. 5% (according to IEC 63: series E24)
   D. 10% (according to IEC 63: series E12)
   E. 20% (according to IEC 63: series E6)
   The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.
   The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*
   The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R. The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*
   The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER,* preceded by a hyphen (–)
   The NUMBER indicates the depletion layer in μm. The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER,* preceded by a stroke (/).
   The NUMBER indicates how many basic devices are assembled into the array.

* When these serial numbers are exhausted the serial number for consumer types may be extended to four figures, and that for industrial types to three figures.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R.M.S. value
S, s	As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.

Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)
Example I_B

b) instantaneous total values
Example i_B

c) average total values
Example $I_{B(AV)}$

d) peak total values
Example I_{BM}

e) root-mean-square total values
Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values
Example i_b

b) root-mean-square values
Example $I_{b(rms)}$

c) peak values
Example I_{bm}

d) average values
Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, i_B, i_b, I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F, I_R, i_F, $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE}, v_{BE}, v_{be}, V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F, V_R, v_F, V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC}, I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example : V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

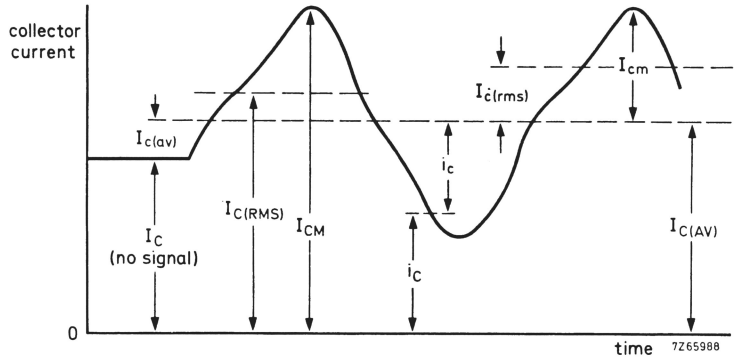
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERS

Definition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f = forward; forward transfer
I, i (or 1) = input
L, l = load
O, o (or 2) = output
R, r = reverse; reverse transfer
S, s = source

Examples: Z_S, h_f, h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples : h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)

R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE}, y_{RE}, h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
h_o (or h_{22})
h_f (or h_{21})
h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

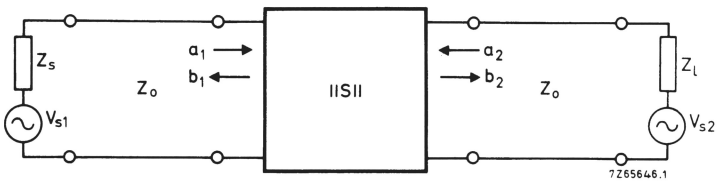
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
Im (h_{ib}) etc. for the imaginary part of h_{ib}

SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to travelling wave conditions. The figure below shows a two-port network with the incident and reflected waves a_1, b_1, a_2 and b_2.



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}} \qquad 1)$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_o}} \qquad b_2 = \frac{V_{r2}}{\sqrt{Z_o}}$$

Z_o = characteristic impedance of the transmission line in which the two-port is connected.

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$
$$b_2 = s_{21}a_1 + s_{22}a_2$$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$s_i = s_{11} = \frac{b_1}{a_1}\bigg|_{a_2 = 0}$$

$$s_r = s_{12} = \frac{b_1}{a_2}\bigg|_{a_1 = 0}$$

$$s_f = s_{21} = \frac{b_2}{a_1}\bigg|_{a_2 = 0}$$

$$s_o = s_{22} = \frac{b_2}{a_2}\bigg|_{a_1 = 0}$$

1) The squares of these quantities have the dimension of power.

The s-parameters can be named and expressed as follows:

$s_i = s_{11}$ = Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.
The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

$s_f = s_{21}$ = Forward transmission coefficient.
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$

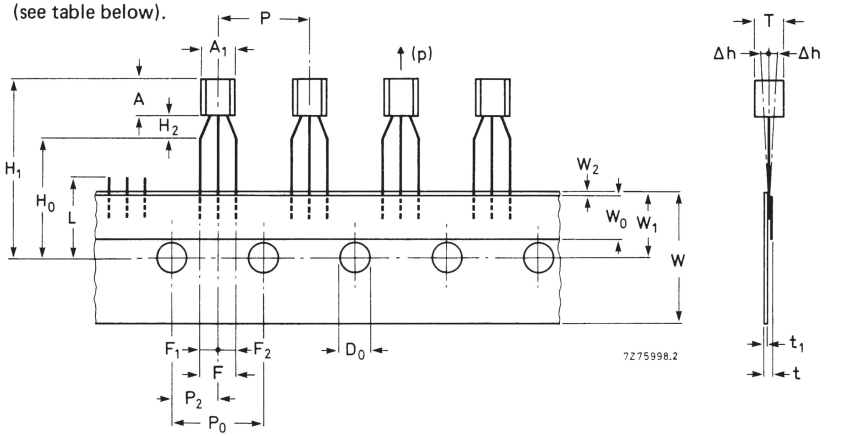
$s_o = s_{22}$ = Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

TO-92 VARIANT TRANSISTORS ON TAPE

MECHANICAL DATA

Dimensions in mm

Fig. 1 (see table below).



Item	Symbol	Specifications				Remarks
		min.	nom.	max.	tol.	
Body width	A_1	4,0		4,8		
Body height	A	4,8		5,2		
Body thickness	T	3,9		4,2		
Pitch of component	P		12,7		± 1	
Feed hole pitch	P_0		12,7		± 0,3	Cumulative pitch error 1,0 mm/20 pitch
Feed hole centre to component centre	P_2		6,35		± 0,4	To be measured at bottom of clinch
Distance between outer leads	F		5,08		+ 0,6 −0,2	
Component alignment	Δh		0	1		At top of body
Tape width	W		18		± 0,5	
Hold-down tape width	W_0		6		± 0,2	
Hole position	W_1		9		+ 0,7 −0,5	
Hold-down tape position	W_2		0,5		± 0,2	
Lead wire clinch height	H_0		16		± 0,5	
Component height	H_1			32,25		
Length of snipped leads	L			11,0		
Feed hole diameter	D_0		4		± 0,2	
Total tape thickness	t			1,2		t_1 0,3-0,6
Lead-to-lead distance	F_1, F_2		2,54		+ 0,4 −0,1	
Clinch height	H_2			3		
Pull-out force	(p)	6N				

PACKING

The transistors are supplied on tape in boxes (ammopack) or on reels. The number per reel is 1600 and per ammobox 2000*.

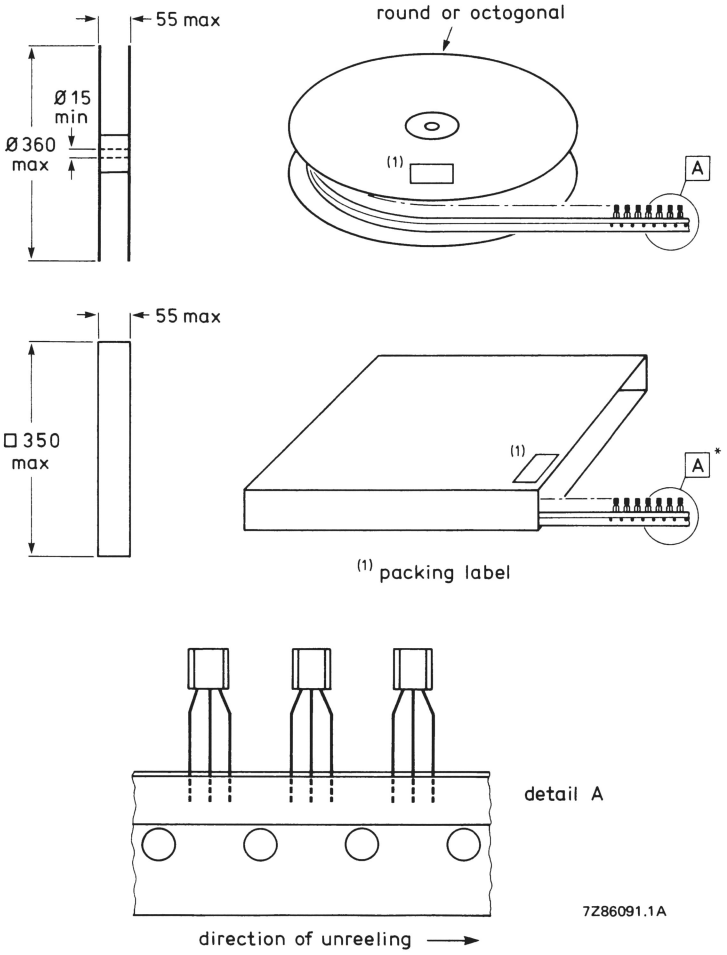


Fig. 2 Dimensions (in mm) of reel and box.

DROPOUTS

A maximum of 0,5% of the specified number of transistors in each packing may be missing. Up to 3 consecutive components may be missing provided the gap is followed by 6 consecutive components.

TAPE SPLICING

Slice the carrier tape on the back and/or front so that the feed hole pitch (P_0) is maintained (see Fig. 3).

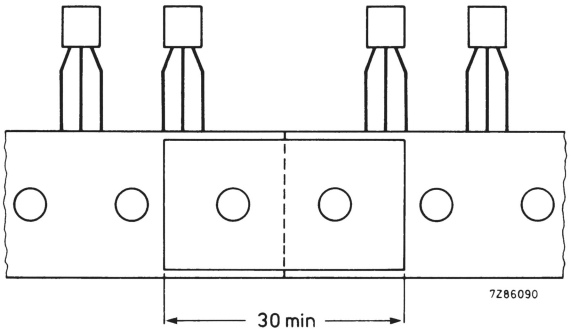


Fig. 3 Jointing tape with splicing patch.

* The ammobox has 80 layers of 25 transistors each.
Each layer contains 25 transistors plus one empty position in order to fold the layer correctly.

The ammobox is accessible from both sides enabling the user to choose between "normal" (see Fig. 2) and "reverse" tape.

SOLDERING RECOMMENDATIONS SOT-37 AND SOT-103

Transistors in SOT-37 and SOT-103 envelopes may be mounted with leads flat (Fig. 1) or bent (Figs 2 and 3). Different soldering procedures apply for the different styles of mounting.

FLAT-LEAD MOUNTING

Soldering by hand

Avoid putting any force on the leads during or just after soldering.

Solder the three leads one at a time, *not* simultaneously.

Proceed from one lead to the adjacent lead, *not* to the opposite one.

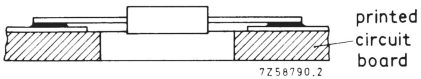


Fig. 1

Solder temperature	max.	300 °C
Soldering time	max.	5 s
Solder-to-case distance	min.	2 mm

BENT-LEAD MOUNTING

If leads are bent, all three may be soldered simultaneously if desired.

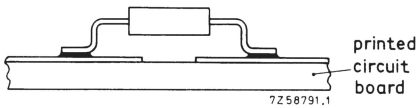


Fig. 2

Solder temperature	max.	300 °C
Soldering time	max.	10 s

DIP OR WAVE SOLDERING

When dip or wave soldering, the maximum allowable temperature of the solder is 260 °C. This temperature must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted up to the lead projections, but the temperature of the body must not exceed the specified storage maximum.

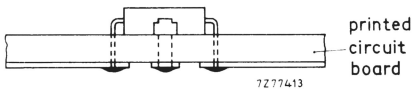


Fig. 3

Solder temperature	max.	260 °C
Soldering time	max.	5 s

RECOMMENDATIONS FOR MOUNTING ¼" CAPSTAN ENVELOPES

A brass nut is supplied with each transistor for securing it to a heatsink.

Screw thread, diameter and nuts:

stud diameter	thread	maximum diameter of threaded stud	nut thickness
¼"	8-32UNC-2A(B)	4,14 mm	3,5 mm SOT-48 5,0 mm SOT-122

To ensure optimum heat transfer and to avoid damage to the threaded stud of the transistor the following recommendations should be observed:

1. Diameter of the mounting hole in the heatsink 4,15 + 0,05; −0 mm (max. 4,2 mm).
2. Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxydation.
3. Torque on nut: minimum 0,75 Nm (7,5 kgcm), maximum 0,85 Nm (8,5 kgcm).
4. Recommended distance from the top surface of the heatsink to surface of printed-circuit board: 2,9 + 0; −0,2 mm.

Tension in the transistor leads sets the limit on spacing between heatsink and printed-circuit board; in general, the leads can withstand more pull in the downward direction than in the upward direction.

Solder the leads to the connection pads with resin-cored tin-lead solder, using an iron of normal temperature. Soldering iron temperatures as high as 350 °C are safely tolerable; the transistor can withstand an interior temperature of 250 °C for about ten minutes.

The leads may be tinned, if required, by dipping them into a solder bath at about 230 °C; each lead may be dipped up to its full length. A flux of the quality of Super-Safe is recommended; after tinning, surplus flux should be rinsed away with tap water.

DEVICE DATA

Wideband transistors

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-92 envelope intended for application as an amplifier or oscillator in the v.h.f. and u.h.f. range.

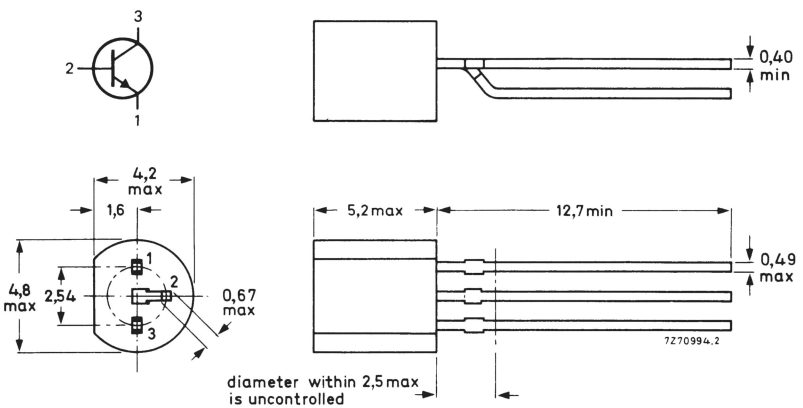
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	360	mW
D.C. current gain				
I_C = 2 mA; V_{CE} = 5 V	h_{FE}	>	20	
I_C = 20 mA; V_{CE} = 5 V		35 to	70	
Transition frequency at f = 500 MHz				
I_C = 15 mA; V_{CE} = 5 V	f_T	typ.	1,8	GHz

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-92 variant.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage			
$R_{BE} \leqslant 50\ \Omega$	V_{CER}	max.	25 V
$I_B = 0$	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
average	I_{CAV}	max.	25 mA
peak value; $t_{on} < 1\ \mu s$	I_{CM}	max.	50 mA
Total power dissipation up to $T_{amb} = 60\ ^oC$	P_{tot}	max.	360 mW
Junction temperature	T_j	max.	150 °C
Storage temperature	T_{stg}	−55 to +150	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	max.	250 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Collector cut-off current			
$V_{CB} = 15$ V; $I_E = 0$	I_{CBO}	max.	50 nA
Emitter cut-off current			
$V_{EB} = 2$ V; $I_C = 0$	I_{EBO}	max.	1 μA
Saturation voltages			
$I_C = 25$ mA; $I_B = 1{,}25$ mA	V_{CEsat}	max.	1 V
	V_{BEsat}	max.	1 V
D.C. current gain			
$I_C = 2$ mA; $V_{CE} = 5$ V	h_{FE}	min.	20
$I_C = 20$ mA; $V_{CE} = 5$ V		35 to	70
Transition frequency at f = 500 MHz			
$I_C = 15$ mA; $V_{CE} = 5$ V	f_T	typ.	1,8 GHz
Feedback capacitance			
$I_C = 2$ mA; $V_{CE} = 5$ V	C_{re}	typ.	1,1 pF
Noise figure at f = 100 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$	F	typ.	4 dB
Noise figure at f = 200 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$	F	typ.	3 dB
Power gain at f = 100 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$; $R_L = 2\ k\Omega$	G_P	typ.	16 dB
Power gain at f = 200 MHz			
$I_C = 2$ mA; $V_{CE} = 5$ V; $R_S = 60\ \Omega$; $R_L = 920\ \Omega$	G_P	typ.	16 dB

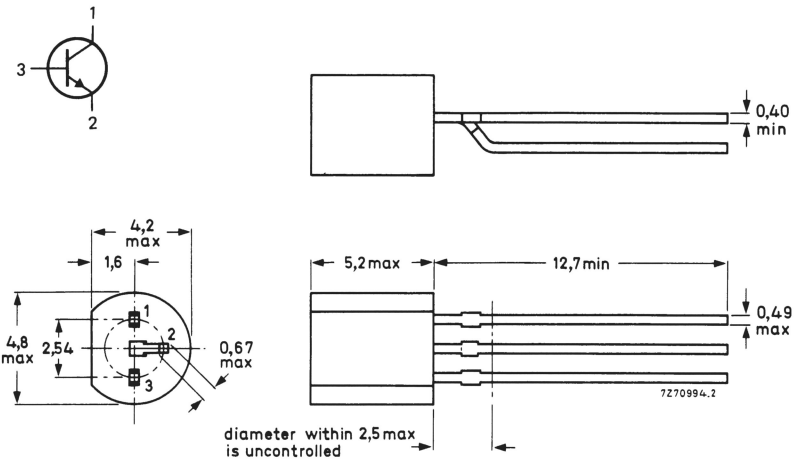
H.F. SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-92 envelope. It is primarily intended for use in H.F. amplifiers and u.h.f. oscillators.

QUICK REFERENCE DATA

Collector-emitter breakdown voltage	$V_{(BR)CEO}$	max.	15	V
Collector-base breakdown voltage	$V_{(BR)CBO}$	max.	25	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	150	°C
D.C. current gain I_C = 5 mA; V_{CE} = 10 V	h_{FE}	min. max.	25 250	
Transition frequency at f = 100 MHz I_C = 5 mA; V_{CE} = 10 V	f_T	typ.	1,8	GHz
Noise figure at R_G = 60 Ω I_C = 5 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	5	dB

Fig. 1 TO-92var. Dimensions in mm



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage	V_{CEO}	max.	15	V
Collector-base voltage	V_{CBO}	max.	25	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	150	°C
Storage temperature	T_s	−65 to +	150	°C

THERMAL RESISTANCE

From junction to ambient	$R_{th\ j\text{-}a}$	<	250	K/W

CHARACTERISTICS

Collector-emitter breakdown voltage I_C = 1 mA; I_B = 0	$V_{(BR)CEO}$	max.	15	V
Collector-base breakdown voltage I_C = 10 mA; I_E = 0	$V_{(BR)CBO}$	max.	25	V
Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50	nA
D.C. current gain I_C = 5 mA; V_{CE} = 10 V	h_{FE}	min. max.	25 250	
Collector-emitter saturation voltage I_C = 10 mA; I_B = 1 mA	V_{CEsat}	max.	0,5	V
Transition frequency at f = 100 MHz I_C = 5 mA; V_{CE} = 10 V	f_T	typ.	1,8	GHz
Noise figure at R_G = 60 Ω I_C = 5 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	5	dB

SILICON WIDEBAND TRANSISTOR

Silicon-epitaxial p-n-p transistor in a four-lead dual emitter plastic envelope (SOT-103). This device is designed for application in linear wideband amplifiers up to 2 GHz.

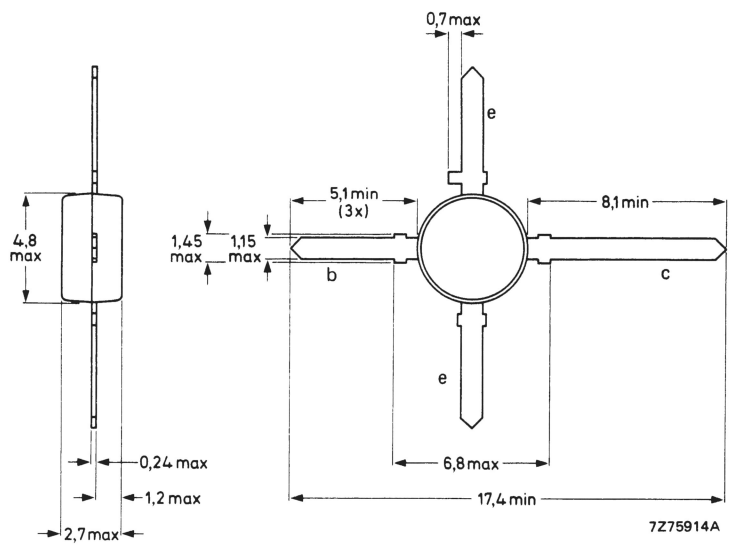
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 0; $-V_{CE}$ = 10 V	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C$ = 30 mA; $-V_{CE}$ = 8 V; f = 800 MHz	F	typ.	3,7 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2,0 V
Collector current			
d.c.	$-I_C$	max.	35 mA
peak value; f > 1 MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)	$R_{th\ j\text{-}a}$		500 K/W

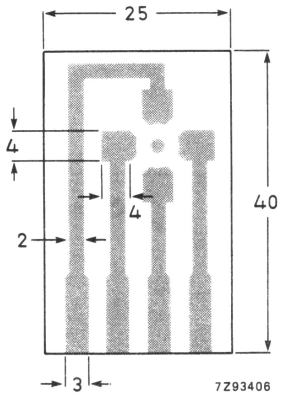


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; $-V_{CB}$ = 5 V	$-I_{CBO}$	max.	50 nA
D.C. current gain *			
$-I_C$ = 30 mA; $-V_{CE}$ = 5 V	h_{FE}	min.	20
Transition frequency at f = 500 MHz *			
$-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5,0 GHz
Noise figure at optimum source impedance and $-V_{CE}$ = 8 V; f = 800 MHz; T_{amb} = 25 °C			
at $-I_C$ = 4 mA	F	typ.	2,3 dB
at $-I_C$ = 30 mA	F	typ.	3,7 dB

* Measured under pulse conditions.

Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $-V_{CB} = 5$ V	C_c	typ.	1,35 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ.	1,8 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	0,8 pF
Maximum unilateral power gain at $T_{amb} = 25$ °C G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2][1-\lvert s_{oe}\rvert^2]}$			
$-I_C = 30$ mA; $V_{CE} = 5$ V; f = 800 MHz	G_{UM}	typ.	14,5 dB
$-I_C = 30$ mA; $V_{CE} = 5$ V; f = 2 GHz		typ.	6,5 dB
Intermodulation distortion (see Fig. 3) $-I_C = 30$ mA; $-V_{CE} = 8$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_o = 400$ mV at $f_p = 795{,}25$ MHz $V_q = V_o - 6$ dB at $f_q = 803{,}25$ MHz $V_r = V_o - 6$ dB at $f_r = 805{,}25$ MHz measured at $f_{(p+q-r)} = 793{,}25$ MHz	d_{im}	typ.	−60 dB
Second harmonic distortion (see Fig. 3) $-I_C = 30$ mA; $-V_{CE} = 8$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_o = 60$ mV at $f_p = 250$ MHz $V_q = V_o = 60$ mV at $f_q = 560$ MHz measured at $f_{(p+q)} = 810$ MHz	d_2	typ.	−50 dB

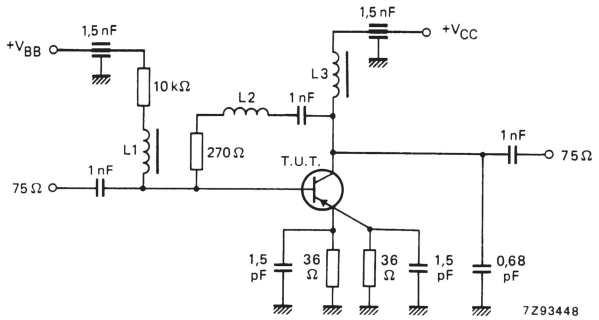


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH micro-choke
L2 = 3 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at V_{CE} = 5 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,54/ −29,5°	12,28/168,4°	0,02/ 78,6°	0,97/ −11,8°	36,1
	100	0,56/ −64,9°	11,14/149,9°	0,04/ 65,3°	0,89/ −27,2°	29,3
	200	0,61/−103,7°	8,87/130,0°	0,07/ 50,0°	0,73/ −44,8°	24,3
5	500	0,65/−154,8°	4,54/ 97,4°	0,09/ 34,6°	0,42/ −69,9°	16,4
	800	0,66/−171,6°	3,06/ 82,9°	0,10/ 34,4°	0,41/ −80,1°	13,0
	1000	0,68/−179,6°	2,51/ 73,4°	0,11/ 34,2°	0,42/ −89,7°	11,6
	2000	0,67/ 144,3°	1,28/ 49,7°	0,15/ 49,5°	0,29/−115,8°	5,1
	40	0,31/ −53,6°	17,95/165,0°	0,01/ 76,2°	0,95/ −16,1°	35,6
	100	0,43/ −98,5°	15,36/144,0°	0,03/ 61,9°	0,82/ −36,2°	29,5
	200	0,56/−131,6°	11,30/123,0°	0,05/ 49,0°	0,63/ −57,4°	24,9
10	500	0,65/−169,0°	5,25/ 94,1°	0,07/ 43,5°	0,33/ −86,7°	17,3
	800	0,66/ 178,8°	3,49/ 81,7°	0,08/ 46,8°	0,33/ −95,0°	13,8
	1000	0,67/ 172,7°	2,81/ 72,7°	0,09/ 47,6°	0,35/−104,4°	12,1
	2000	0,67/ 140,0°	1,47/ 51,5°	0,15/ 58,5°	0,22/−133,4°	6,2
	40	0,21/−116,7°	22,60/162,0°	0,01/ 73,9°	0,91/ −20,1°	35,1
	100	0,42/−134,0°	18,46/138,9°	0,02/ 61,2°	0,75/ −44,0°	29,8
	200	0,57/−154,2°	12,68/118,0°	0,03/ 52,4°	0,55/ −67,8°	25,3
20	500	0,66/−178,3°	5,75/ 92,1°	0,05/ 54,5°	0,29/−101,8°	18,0
	800	0,66/ 173,0°	3,77/ 79,9°	0,07/ 57,8°	0,29/−108,3°	14,4
	1000	0,66/ 168,7°	3,00/ 72,0°	0,09/ 57,6°	0,31/−116,7°	12,5
	2000	0,68/ 137,5°	1,56/ 52,1°	0,16/ 63,8°	0,20/−150,2°	6,8
	40	0,29/−147,1°	23,95/161,0°	0,01/ 72,2°	0,88/ −21,8°	34,6
	100	0,47/−151,7°	19,33/137,4°	0,02/ 62,0°	0,72/ −47,2°	29,9
	200	0,59/−162,6°	12,97/116,4°	0,03/ 56,1°	0,51/ −72,0°	25,4
30	500	0,68/ 177,7°	5,74/ 91,3°	0,05/ 60,1°	0,27/−107,9°	18,2
	800	0,66/ 170,0°	3,77/ 79,3°	0,07/ 62,5°	0,27/−113,2°	14,4
	1000	0,67/ 166,6°	3,00/ 71,6°	0,08/ 61,8°	0,30/−121,1°	12,5
	2000	0,70/ 136,5°	1,56/ 52,0°	0,16/ 65,9°	0,20/−156,2°	6,9

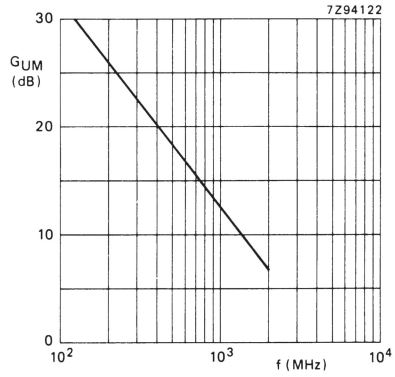


Fig. 4 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C.

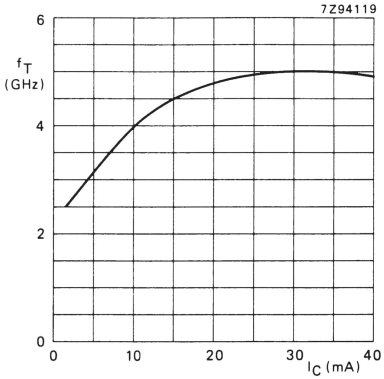


Fig. 5 V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C.

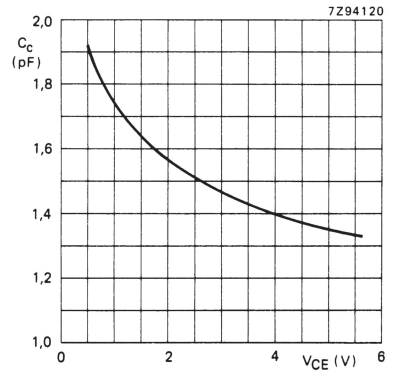


Fig. 6 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

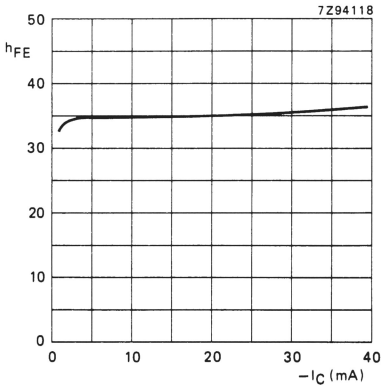


Fig. 7.

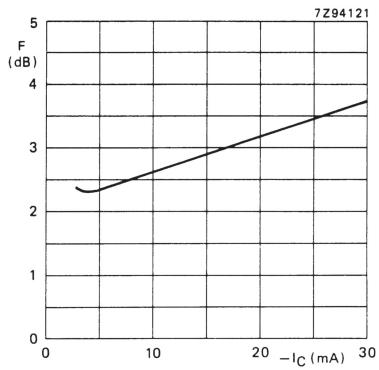


Fig. 8 V_{CE} = 8 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C.

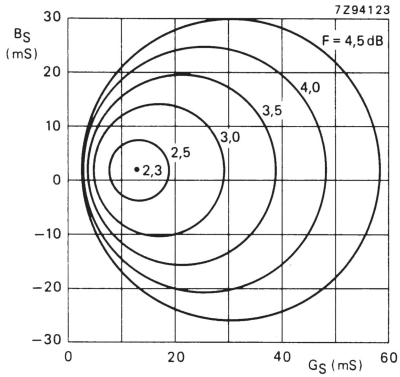


Fig. 9 V_{CE} = 8 V; I_C = 4 mA; f = 800 MHz.

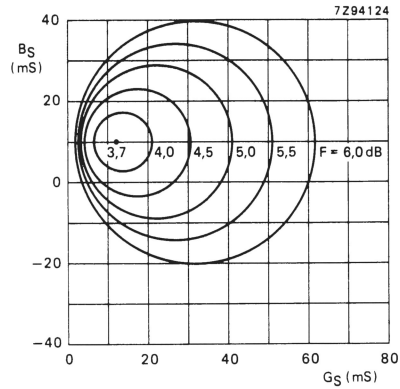


Fig. 10 V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz.

SILICON PLANAR TRANSISTOR

Silicon-epitaxial p-n-p transistor in a four-lead dual emitter plastic envelope (SOT-103). The device is designed for application in linear wideband amplifiers up to 2 GHz.

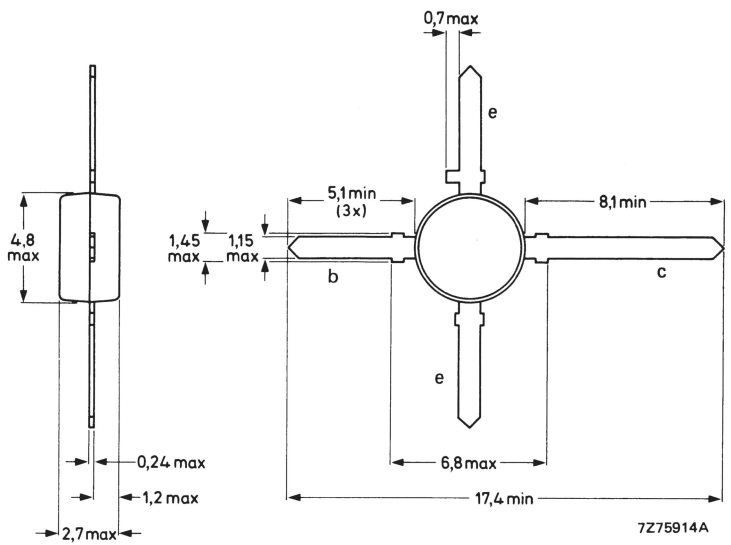
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	75 mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 °C
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	typ.	4,5 GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 0; $-V_{CE}$ = 10 V	C_{re}	typ.	1,4 pF
Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 800 MHz	F	typ.	4,3 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3,0 V
Collector current			
d.c.	$-I_C$	max.	75 mA
peak value; > 1 MHz	$-I_{CM}$	max.	150 mA
Total power dissipation up to T_{amb} = 70 °C			
mounted on print (see Fig. 2)	P_{tot}	max.	700 mW
Storage temperature	T_{stg}		−65 to +175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted	$R_{th\ j\text{-}a}$	150 K/W
on a fibre-glass print (see Fig. 2)	$R_{th\ j\text{-}c}$	75 K/W

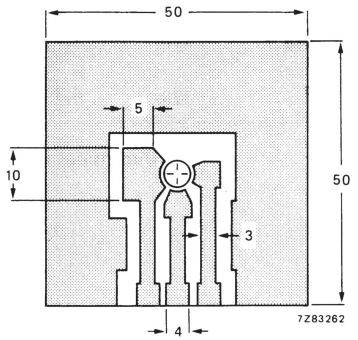


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; $-V_{CB}$ = 10 V	$-I_{CBO}$	max.	100 nA
D.C. current gain *			
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20
Transition frequency at f = 500 MHz *			
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	typ.	4,5 GHz
Noise figure at optimum source impedance and			
$-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	4,3 dB

* Measured under pulse conditions

Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	2,0 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ.	5,0 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	1,4 pF
Maximum unilateral power gain at $T_{amb} = 25$ °C $G_{UM} = 10 \log \frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2][1-\lvert s_{oe}\rvert^2]}$			
$-I_C = 50$ mA; $-V_{CE} = 10$ V; f = 800 MHz	G_{UM}	typ.	13,0 dB
$-I_C = 50$ mA; $-V_{CE} = 10$ V; f = 2 GHz		typ.	6,0 dB
Intermodulation distortion (see Fig. 3) $-I_C = 70$ mA; $-V_{CE} = 10$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_o = 500$ mV at $f_p = 795{,}25$ MHz $V_q = V_o - 6$ dB at $f_q = 803{,}25$ MHz $V_r = V_o - 6$ dB at $f_r = 805{,}25$ MHz measured at $f_{(p+q-r)} = 793{,}25$ MHz	d_{im}	typ.	−60 dB
Second harmonic distortion (see Fig. 3) $-I_C = 70$ mA; $-V_{CE} = 10$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_o = 150$ mV at $f_p = 250$ MHz $V_q = V_o = 150$ mV at $f_q = 560$ MHz measured at $f_{(p+q)} = 810$ MHz	d_2	typ.	−50 dB

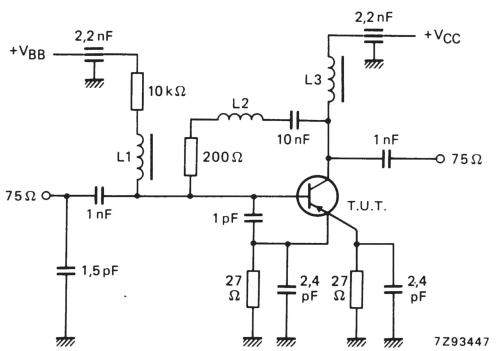


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro-choke
L2 = 1,5 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,75/ −42,7°	13,76/159,7°	0,03/ 70,9°	0,93/ −20,1°	35,4
	100	0,74/ −90,7°	10,76/133,3°	0,06/ 49,2°	0,74/ −41,9°	27,5
	200	0,75/−128,8°	6,95/112,1°	0,08/ 33,6°	0,52/ −59,2°	21,8
5	500	0,74/−167,7°	2,99/ 83,6°	0,09/ 25,1°	0,32/ −79,5°	13,4
	800	0,74/−178,7°	2,01/ 69,0°	0,10/ 26,8°	0,37/ −89,3°	10,1
	1000	0,74/−172,2°	1,62/ 59,3°	0,11/ 27,7°	0,41/ −99,6°	8,4
	2000	0,76/ 139,8°	0,80/ 33,3°	0,14/ 47,5°	0,40/−139,1°	2,6
	40	0,61/ −63,4°	22,06/153,0°	0,03/ 65,7°	0,88/ −30,7°	35,3
	100	0,67/−115,6°	15,20/124,9°	0,05/ 44,3°	0,62/ −61,2°	28,4
	200	0,73/−146,7°	8,95/106,0°	0,06/ 34,0°	0,41/ −85,1°	23,1
10	500	0,74/−176,1°	3,76/ 83,3°	0,07/ 36,2°	0,25/−117,2°	15,3
	800	0,73/ 173,2°	2,46/ 70,5°	0,09/ 40,5°	0,28/−119,4°	11,5
	1000	0,73/ 168,5°	1,95/ 62,1°	0,10/ 41,8°	0,33/−126,0°	9,6
	2000	0,75/ 137,4°	1,01/ 38,2°	0,16/ 53,3°	0,31/−159,4°	4,1
	40	0,50/ −93,5°	30,50/146,0°	0,02/ 60,6°	0,81/ −43,2°	35,5
	100	0,66/−138,4°	18,73/118,4°	0,03/ 42,7°	0,53/ −82,0°	29,4
	200	0,72/−160,8°	10,50/101,8°	0,04/ 38,9°	0,38/−111,9°	24,3
20	500	0,74/ 178,5°	4,30/ 83,3°	0,06/ 48,9°	0,28/−148,3°	16,5
	800	0,73/ 168,9°	2,78/ 71,6°	0,08/ 52,5°	0,30/−147,7°	12,6
	1000	0,73/ 165,2°	2,22/ 63,3°	0,09/ 52,3°	0,54/−150,6°	10,7
	2000	0,75/ 135,5°	1,16/ 42,2°	0,17/ 57,5°	0,30/ 176,9°	5,3
	40	0,48/−111,8°	34,57/142,5°	0,02/ 58,6°	0,76/ −50,3°	35,7
	100	0,67/−148,2°	20,08/115,3°	0,03/ 43,8°	0,50/ −93,2°	29,9
	200	0,73/−166,2°	10,99/ 99,9°	0,03/ 43,7°	0,38/−124,1°	24,8
30	500	0,74/ 175,8°	4,50/ 83,2°	0,05/ 55,4°	0,32/−158,2°	17,0
	800	0,73/ 168,4°	2,08/ 72,1°	0,08/ 57,7°	0,32/−157,9°	13,0
	1000	0,73/ 164,3°	2,32/ 64,2°	0,09/ 56,6°	0,35/−159,8°	11,2
	2000	0,75/ 134,8°	1,21/ 44,0°	0,17/ 59,2°	0,32/ 167,5°	5,8
	40	0,49/−131,2°	38,80/139,8°	0,01/ 57,1°	0,70/ −58,7°	35,9
	100	0,69/−157,6°	21,05/112,6°	0,02/ 46,5°	0,48/−104,7°	30,3
	200	0,73/−171,3°	11,50/ 98,3°	0,03/ 49,5°	0,39/−134,9°	25,2
50	500	0,75/ 174,1°	4,60/ 82,4°	0,05/ 61,6°	0,35/−165,6°	17,4
	800	0,73/ 166,8°	2,97/ 71,5°	0,08/ 62,0°	0,34/−165,3°	13,4
	1000	0,73/ 162,7°	2,37/ 64,1°	0,09/ 59,9°	0,37/−166,8°	11,4
	2000	0,76/ 134,0°	1,24/ 45,3°	0,18/ 60,9°	0,34/ 160,9°	6,2

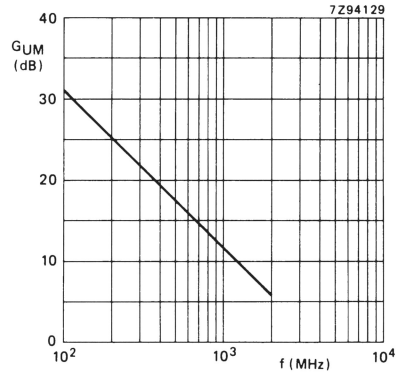


Fig. 4 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C

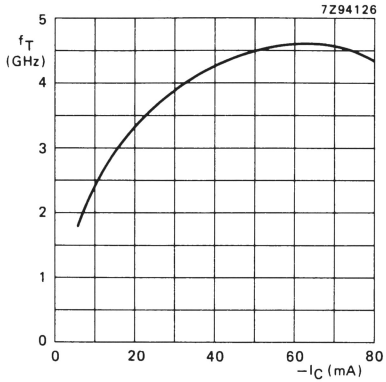


Fig. 5 V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C.

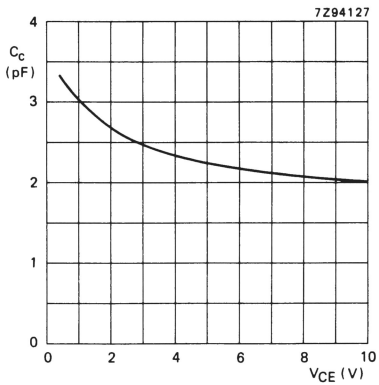


Fig. 6 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

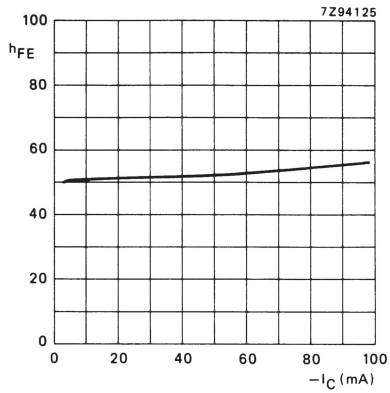


Fig. 7.

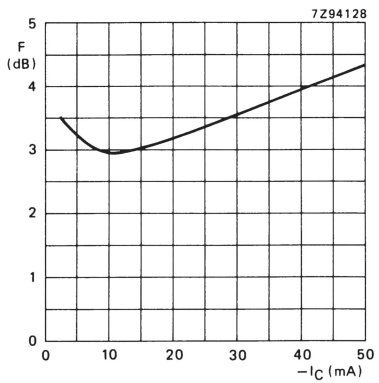


Fig. 8 V_{CE} = 10 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C.

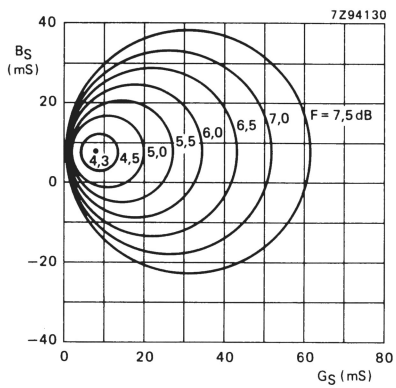


Fig. 9 V_{CE} = 10 V; I_C = 50 mA; f = 800 MHz.

SILICON WIDEBAND TRANSISTOR

Silicon epitaxial n-p-n transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for wideband application in CATV and MATV amplifier systems and features high output voltage capabilities.

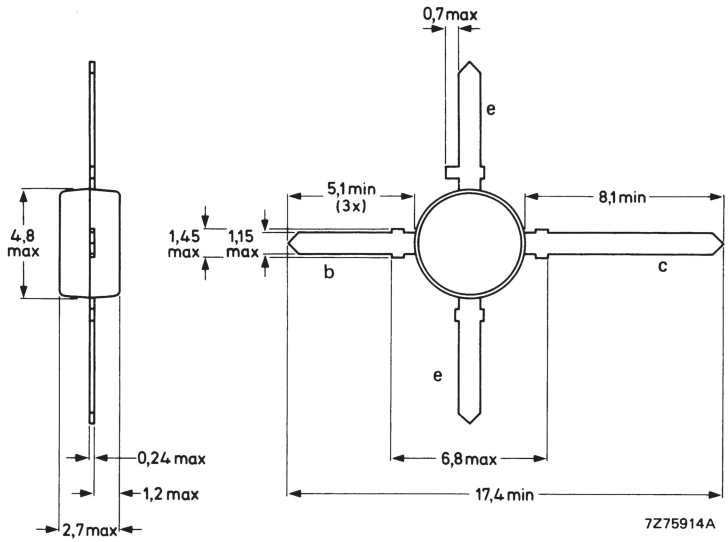
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1 W
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7 GHz
Noise figure at optimum source impedance I_C = 20 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	2,3 dB
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	P_{L1}	typ.	+22 dBm
Third order intercept point V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	ITO	typ.	+41 dBm

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 45 °C mounted on a fibre-glass p.c.b. (see Fig. 2)	P_{tot}	max.	1 W
Storage temperature	T_{stg}		−65 to +175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a glass-fibre p.c.b. (see Fig. 2)	$R_{th\ j\text{-}a}$	=	130 K/W
	$R_{th\ j\text{-}c}$	=	50 K/W

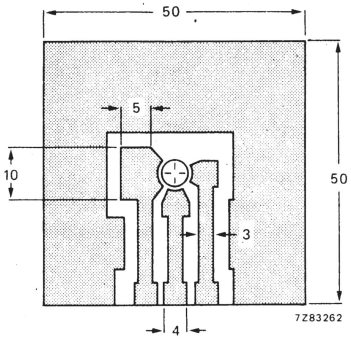


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	200 nA
D.C. current gain * I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz * I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7 GHz
Collector output capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	2,3 pF
Emitter capacitance at f = 1 MHz $I_C = i_e$ = 0; V_{EB} = 0,5 V	C_e	typ.	10 pF
Feedback capacitance at f = 1 MHz I_E = 0; V_{CB} = 10 V	C_{re}	typ.	1,2 pF

* Measured under pulse conditions.

Maximum unilateral power gain at T_{amb} = 25 °C

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{[1-|s_{ie}|^2][1-|s_{oe}|^2]}$$

I_C = 100 mA; V_{CB} = 10 V; f = 800 MHz	G_{UM}	typ.	14 dB
I_C = 100 mA; V_{CE} = 10 V; f = 2 GHz		typ.	7 dB
Noise figure at optimum source impedance			
I_C = 20 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	2,3 dB
Output power at 1 dB gain compression			
V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	P_{L1}	typ.	+22 dBm
V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz		typ.	+24 dBm
Third order intercept point			
V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	ITO	typ.	+41 dBm
V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz		typ.	+43 dBm
Intermodulation distortion (see Fig. 3)			
I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C			
$V_p = V_o$ at d_{im} = −60 dB, f_p = 795,25 MHz			
$V_q = V_o - 6$ dB at f_q = 803,25 MHz			
$V_r = V_o - 6$ dB at f_r = 805,25 MHz			
measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	750 mV
Second harmonic distortion (see Fig. 3)			
I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C			
$V_p = V_o$ = 316 mV at f_p = 250 MHz			
$V_q = V_o$ = 316 mV at f_q = 560 MHz			
measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−55 dB

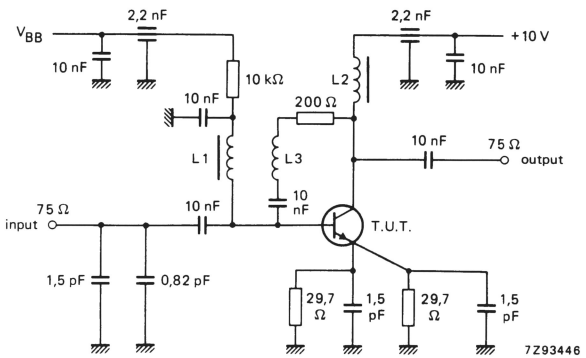


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L2 = 5 μH Ferroxcube choke
L3 = 2 turns Cu wire (0,5 mm), internal diameter 4 mm, winding pitch 2 mm

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,91/ −40,7°	13,50/156,6°	0,03/ 69,3°	0,95/ −16,4°	40,1
	100	0,95/ −87,6°	10,34/131,2°	0,05/ 46,6°	0,77/ −32,1°	29,6
	200	0,85/−126,7°	6,59/109,7°	0,07/ 30,2°	0,59/ −42,3°	22,9
5	500	0,78/−167,3°	2,81/ 79,9°	0,07/ 20,9°	0,45/ −58,1°	14,1
	800	0,78/ 177,2°	1,84/ 64,7°	0,07/ 27,3°	0,51/ −73,6°	10,7
	1000	0,78/ 169,7°	1,47/ 54,6°	0,07/ 33,5°	0,56/ −86,6°	9,1
	1200	0,82/ 162,2°	1,14/ 48,7°	0,07/ 45,7°	0,52/−101,5°	7,4
	2000	0,82/ 140,5°	0,67/ 27,6°	0,12/ 71,3°	0,42/−138,0°	2,2
	40	0,85/ −48,2°	20,90/154,7°	0,03/ 66,3°	0,92/ −23,3°	40,2
	100	0,80/ −98,7°	14,77/126,7°	0,05/ 43,6°	0,68/ −45,0°	30,6
	200	0,78/−135,7°	3,99/106,9°	0,06/ 30,4°	0,47/ −58,5°	24,1
10	500	0,76/−171,8°	3,78/ 81,8°	0,06/ 28,6°	0,30/ −74,9°	15,7
	800	0,76/ 175,0°	2,49/ 68,5°	0,07/ 36,9°	0,36/ −85,8°	12,2
	1000	0,76/ 168,4°	1,97/ 58,8°	0,07/ 41,3°	0,41/ −97,4°	10,4
	1200	0,79/ 161,2°	1,56/ 53,9°	0,08/ 51,0°	0,38/−111,8°	8,8
	2000	0,80/ 140,6°	0,96/ 30,6°	0,14/ 66,8°	0,36/−142,8°	4,6
	40	0,81/ −56,5°	28,50/151,5°	0,02/ 63,0°	0,89/ −31,3°	40,6
	100	0,76/−108,9°	19,04/122,8°	0,04/ 41,7°	0,60/ −59,9°	31,4
	200	0,75/ 143,2°	11,19/104,7°	0,05/ 31,7°	0,39/ −80,3°	25,3
20	500	0,74/−175,9°	4,65/ 82,7°	0,06/ 36,2°	0,23/−107,6°	17,0
	800	0,73/ 172,5°	3,00/ 70,7°	0,07/ 44,3°	0,27/−110,2°	13,2
	1000	0,74/ 166,8°	2,41/ 62,2°	0,08/ 47,6°	0,31/−118,3°	11,5
	1200	0,78/ 159,0°	1,94/ 58,9°	0,09/ 55,1°	0,29/−133,5°	10,2
	2000	0,77/ 140,3°	1,23/ 35,4°	0,14/ 63,7°	0,28/−155,5°	6,1
	40	0,79/ −61,1°	32,71/149,4°	0,02/ 61,8°	0,87/ −35,7°	40,7
	100	0,75/−113,4°	21,13/121,0°	0,04/ 40,7°	0,58/ −68,2°	31,8
	200	0,74/−146,2°	12,12/104,0°	0,05/ 32,5°	0,38/ −92,8°	25,8
30	500	0,73/−177,0°	5,04/ 83,7°	0,06/ 39,5°	0,23/−127,4°	17,6
	800	0,73/ 172,0°	3,25/ 72,0°	0,07/ 47,2°	0,25/−126,8°	13,9
	1000	0,73/ 166,9°	2,62/ 63,9°	0,08/ 49,8°	0,29/−132,4°	12,1
	1200	0,77/ 158,6°	2,11/ 61,1°	0,09/ 56,7°	0,28/−147,9°	10,8
	2000	0,76/ 140,0°	1,35/ 38,3°	0,15/ 62,3°	0,24/−165,7°	6,6
	40	0,78/ −64,6°	36,69/147,3°	0,02/ 60,0°	0,86/ −40,3°	41,0
	100	0,73/−118,1°	22,91/119,4°	0,04/ 39,7°	0,56/ −76,5°	32,2
	200	0,73/−148,9°	12,99/102,6°	0,04/ 33,2°	0,37/−104,5°	26,3
50	500	0,73/−178,1°	5,34/ 94,3°	0,06/ 42,6°	0,25/−142,7°	18,1
	800	0,72/ 170,5°	3,48/ 73,1°	0,07/ 49,4°	0,25/−142,0°	14,3
	1000	0,72/ 165,2°	2,72/ 64,8°	0,08/ 51,5°	0,30/−145,6°	12,3
	1200	0,76/ 157,5°	2,25/ 63,0°	0,09/ 58,0°	0,29/−161,1°	11,2
	2000	0,75/ 139,9°	1,44/ 40,5°	0,15/ 60,8°	0,24/−177,2°	7,0

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,78/ −67,3°	38,41/146,4°	0,02/ 59,1°	0,84/ −42,8°	41,1
	100	0,74/−112,0°	23,45/118,2°	0,04/ 39,3°	0,55/ −81,1°	32,4
	200	0,73/−151,1°	13,29/102,3°	0,04/ 33,9°	0,37/−110,4°	26,4
75	500	0,72/−178,4°	5,47/ 84,4°	0,06/ 43,8°	0,27/−149,1°	18,3
	800	0,72/ 170,2°	3,52/ 73,1°	0,07/ 50,3°	0,27/−148,8°	14,4
	1000	0,72/ 164,6°	2,75/ 65,6°	0,09/ 52,1°	0,30/−151,7°	12,4
	1200	0,76/ 157,8°	2,28/ 63,8°	0,09/ 58,3°	0,30/−166,8°	11,3
	2000	0,75/ 139,5°	1,48/ 41,7°	0,16/ 59,7°	0,24/ 175,2°	7,2
	40	0,78/ −68,3°	38,86/145,2°	0,02/ 58,2°	0,83/ −44,4°	41,0
	100	0,74/−121,6°	23,45/117,2°	0,04/ 38,8°	0,54/ −83,1°	23,3
	200	0,73/−151,6°	13,13/101,3°	0,04/ 33,7°	0,37/−112,7°	26,4
100	500	0,73/−179,4°	5,40/ 83,8°	0,06/ 44,3°	0,27/−151,3°	18,2
	800	0,73/ 170,6°	3,52/ 73,4°	0,07/ 50,6°	0,27/−150,9°	14,5
	1000	0,72/ 165,3°	2,75/ 65,4°	0,09/ 52,2°	0,30/−153,4°	12,4
	1200	0,77/ 157,3°	2,25/ 64,1°	0,09/ 58,3°	0,30/−168,6°	11,3
	2000	0,75/ 139,4°	1,46/ 41,9°	0,15/ 59,7°	0,24/ 175,2°	7,1

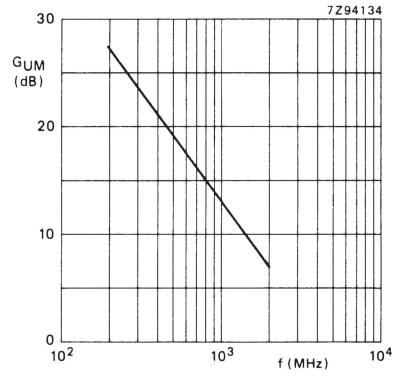


Fig. 4 V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C

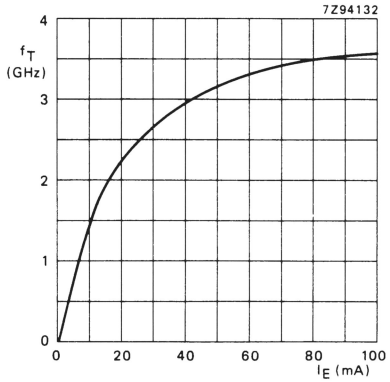


Fig. 5 V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C.

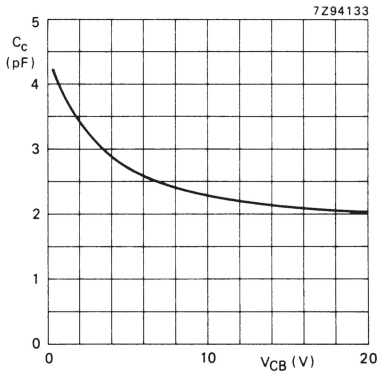


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C.

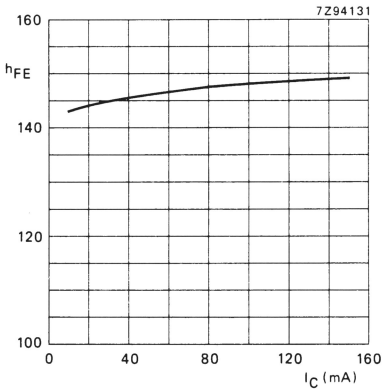


Fig. 7 V_{CE} = 10 V; T_{amb} = 25 °C.

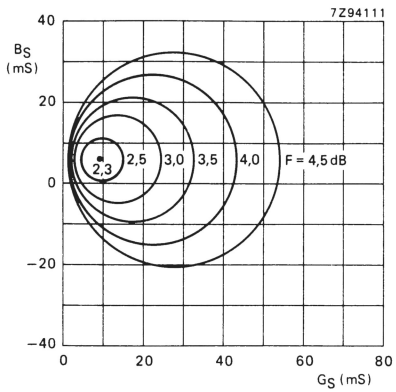


Fig. 8 V_{CE} = 10 V; I_C = 20 mA; f = 800 MHz.

SILICON WIDEBAND TRANSISTOR

Silicon-epitaxial p-n-p transistor in a four-lead dual emitter plastic envelope (SOT-103). This device is designed for application in wideband amplifiers, such as in CATV and MATV systems, up to 2 GHz.

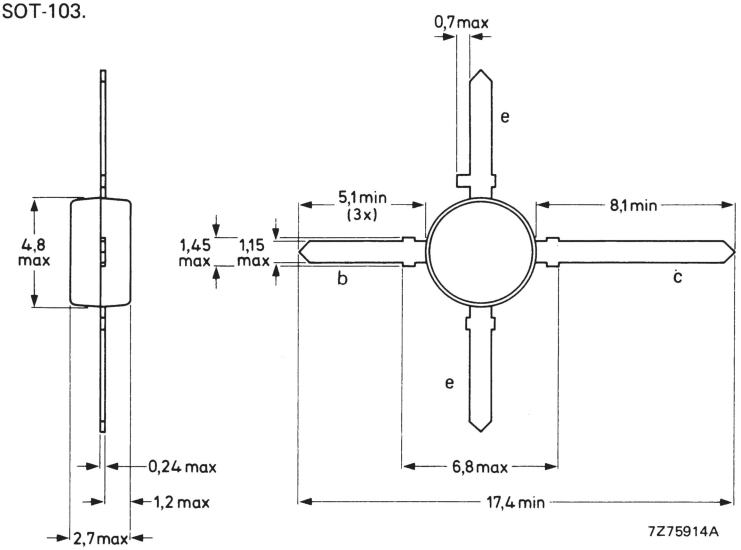
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 °C
D.C. current gain $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	50
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 0; $-V_{CE}$ = 10 V	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 800 MHz	F	typ.	3,4 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2,0 V
Collector current			
d.c.	$-I_C$	max.	25 mA
peak value; $f > 1$ MHz	$-I_{CM}$	max.	35 mA
Total power dissipation up to $T_{amb} = 60$ °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)	$R_{th\ j\text{-}a}$		500 K/W

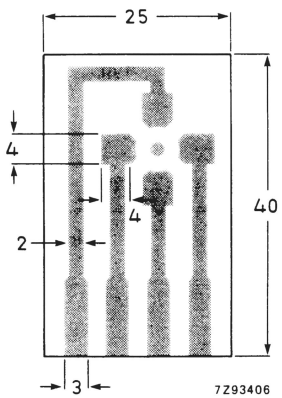


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

$T_j = 25$ °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	50 nA
D.C. current gain *			
$-I_C = 14$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	50
Transition frequency at $f = 500$ MHz *			
$-I_C = 14$ mA; $-V_{CE} = 10$ V	f_T	typ.	5,0 GHz
Noise figure at optimum source impedance and $-V_{CE} = 10$ V; $f = 800$ MHz; $T_{amb} = 25$ °C			
at $-I_C = 4$ mA	F	typ.	2,4 dB
at $-I_C = 14$ mA		typ.	3,4 dB

* Measured under pulse conditions

Collector capacitance at f = 1 MHz $I_E = i_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	0,9 pF
Emitter capacitance at f = 1 MHz $I_C = i_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ.	1,1 pF
Feedback capacitance at f = 1 MHz $I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	0,45 pF
Maximum unilateral power gain at $T_{amb} = 25$ °C (s_{re} assumed to be zero) G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2][1-\lvert s_{oe}\rvert^2]}$			
$-I_C = 14$ mA; $V_{CE} = 10$ V; f = 800 MHz $-I_C = 14$ mA; $V_{CE} = 10$ V; f = 2 GHz	G_{UM}	typ. typ.	17,0 dB 8,0 dB
Intermodulation distortion (see Fig. 3) $-I_C = 14$ mA; $-V_{CE} = 10$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_o = 150$ mV at $f_p = 795{,}25$ MHz $V_q = V_o - 6$ dB at $f_q = 803{,}25$ MHz $V_r = V_o - 6$ dB at $f_r = 805{,}25$ MHz measured at $f_{(p+q+r)} = 793{,}25$ MHz	d_{im}	typ.	−60 dB
Second harmonic distortion (see Fig. 3) $-I_C = 14$ mA; $-V_{CE} = 10$ V; $R_L = 75\ \Omega$; VSWR < 2; $T_{amb} = 25$ °C $V_p = V_o = 150$ mV at $f_p = 250$ MHz $V_q = V_o = 150$ mV at $f_q = 560$ MHz measured at $f_{(p+q)} = 810$ MHz	d_2	typ.	−50 dB

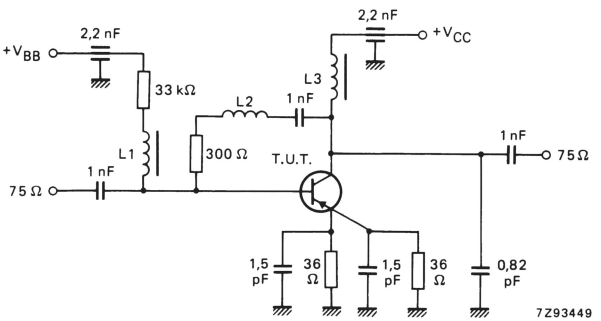


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH micro-choke
L2 = 3 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,66/ 67,4°	13,07/132,5°	0,04/ 48,85°	0,98/ 81,6°	38,4
	100	0,65/ 41,0°	12,29/131,7°	0,04/ 63,68°	0,96/ 49,7°	35,6
	200	0,63/ −25,4°	10,44/136,5°	0,05/ 64,05°	0,82/ 2,7°	27,5
	500	0,50/ −61,8°	6,51/105,8°	0,08/ 44,83°	0,58/−19,6°	19,3
5	800	0,48/−173,2°	4,74/ 87,7°	0,10/ 46,88°	0,49/−29,3°	15,9
	1000	0,46/−170,1°	3,73/ 81,1°	0,10/ 44,70°	0,43/−33,1°	13,4
	1200	0,47/ 178,4°	3,00/ 77,4°	0,11/ 44,80°	0,38/−46,5°	11,3
	1500	0,54/ 169,8°	2,83/ 57,0°	0,13/ 51,10°	0,34/−48,1°	11,1
	2000	0,46/ 144,6°	1,99/ 22,4°	0,15/ 3,95°	0,31/−89,8°	7,4
	40	0,44/ 60,2°	19,40/137,8°	0,04/ 34,23°	0,96/ 79,6°	37,9
	100	0,45/ 24,4°	17,77/129,8°	0,04/ 58,58°	0,91/ 43,5°	33,6
	200	0,47/ −49,4°	14,33/127,2°	0,05/ 57,93°	0,73/ −4,7°	27,5
	500	0,46/ 92,9°	7,69/ 97,6°	0,07/ 48,35°	0,46/−25,9°	19,7
10	800	0,47/−176,4°	5,41/ 82,6°	0,09/ 53,75°	0,38/−30,9°	16,4
	1000	0,48/−179,6°	4,15/ 77,1°	0,09/ 52,53°	0,33/−35,6°	14,0
	1200	0,48/ 167,7°	3,31/ 75,6°	0,10/ 53,53°	0,29/−45,9°	11,9
	1500	0,53/ 159,7°	3,27/ 57,5°	0,12/ 58,70°	0,27/−48,7°	12,0
	2000	0,48/ 137,2°	2,18/ −3,9°	0,15/ 11,33°	0,24/−91,2°	8,1
	40	0,34/ 53,8°	22,33/136,9°	0,04/ 34,05°	0,95/ 78,2°	37,4
	100	0,37/ 11,9°	19,87/131,0°	0,03/ 54,68°	0,88/ 41,3°	33,1
	200	0,42/ −64,7°	15,87/123,1°	0,04/ 57,33°	0,69/ −8,5°	27,6
	500	0,46/ 160,6°	7,89/ 96,8°	0,06/ 51,98°	0,40/−26,8°	19,7
14	800	0,47/−174,4°	5,52/ 81,7°	0,08/ 56,68°	0,34/−32,1°	16,4
	1000	0,48/ 175,9°	4,24/ 75,7°	0,08/ 54,88°	0,30/−37,0°	14,1
	1200	0,50/ 164,4°	3,42/ 74,5°	0,09/ 56,43°	0,27/−44,1°	12,3
	1500	0,55/ 158,1°	3,22/ 54,6°	0,11/ 62,38°	0,24/−45,1°	12,0
	2000	0,49/ 134,9°	2,21/ −5,4°	0,14/ 13,43°	0,22/−90,9°	8,3

s-parameters (common emitter) at V_{CE} = 5 V

I_C MH	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,15/ 3,5°	21,70/136,8°	0,04/ 28,08°	0,91/ 75,5°	34,6
	100	0,31/ −46,9°	18,44/142,5°	0,04/ 64,85°	0,80/ 35,6°	30,2
	200	0,45/ −83,8°	14,16/120,9°	0,04/ 56,45°	0,59/ −15,5°	25,8
	500	0,55/−175,0°	6,59/ 94,1°	0,06/ 52,28°	0,32/ −34,4°	18,4
20	800	0,58/ 177,2°	4,62/ 79,2°	0,08/ 58,35°	0,27/ −36,0°	15,4
	1000	0,57/ 170,3°	3,54/ 73,8°	0,08/ 58,05°	0,24/ −41,3°	12,9
	1200	0,59/ 159,5°	2,82/ 72,9°	0,09/ 59,28°	0,21/ −47,7°	11,1
	1500	0,54/ 150,9°	2,15/ 56,0°	0,11/ 67,55°	0,18/ −36,0°	8,3
	2000	0,58/ 132,1°	1,88/ −6,2°	0,14/ 16,03°	0,19/−108,6°	7,4
	40	0,15/ −27,1°	21,97/138,1°	0,04/ 33,98°	0,90/ 75,4°	34,0
	100	0,32/ −61,0°	18,72/131,1°	0,03/ 64,88°	0,78/ 34,3°	30,1
	200	0,45/ −80,4°	14,08/119,5°	0,04/ 54,00°	0,56/ −15,9°	25,6
	500	0,57/−179,4°	6,43/ 92,4°	0,06/ 53,93°	0,31/ −34,4°	18,3
25	800	0,57/ 174,6°	4,51/ 78,9°	0,08/ 59,20°	0,26/ −35,4°	15,1
	1000	0,59/ 167,5°	3,44/ 73,1°	0,08/ 58,33°	0,23/ −40,1°	12,8
	1200	0,61/ 157,3°	2,76/ 71,8°	0,08/ 61,78°	0,21/ −48,5°	11,1
	1500	0,56/ 151,1°	2,15/ 75,3°	0,10/ 68,93°	0,18/ −24,3°	8,4
	2000	0,60/ 131,8°	1,83/ −6,7°	0,14/ 17,58°	0,19/ −96,0°	7,4
	40	0,19/ −46,2°	21,90/138,3°	0,04/ 28,33°	0,88/ 74,7°	33,3
	100	0,34/ −73,1°	18,18/129,2°	0,03/ 63,73°	0,77/ 30,6°	29,6
	200	0,47/ −67,1°	13,92/118,9°	0,04/ 56,80°	0,55/ −16,8°	25,5
	500	0,58/−176,6°	6,23/ 92,5°	0,05/ 56,93°	0,29/ −30,8°	18,1
30	800	0,59/ 167,6°	4,33/ 77,7°	0,08/ 60,30°	0,26/ −35,6°	14,9
	1000	0,60/ 167,4°	3,32/ 72,7°	0,08/ 59,93°	0,23/ −37,6°	12,6
	1200	0,63/ 157,3°	2,66/ 70,8°	0,09/ 63,13°	0,21/ −45,9°	10,9
	1500	0,57/ 156,7°	2,16/ 49,2°	0,11/ 70,55°	0,19/ −45,4°	8,6
	2000	0,63/ 130,5°	1,80/ −8,2°	0,14/ 19,23°	0,20/ −95,7°	7,5

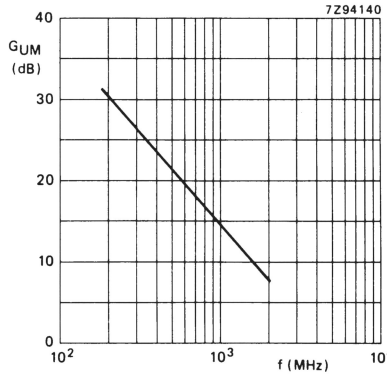


Fig. 4 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

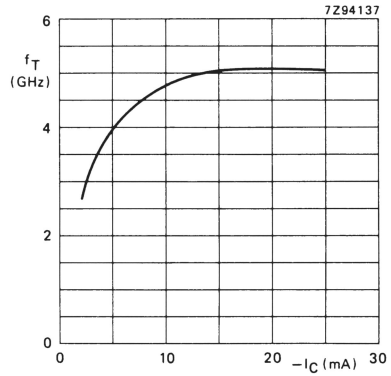


Fig. 5 V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C.

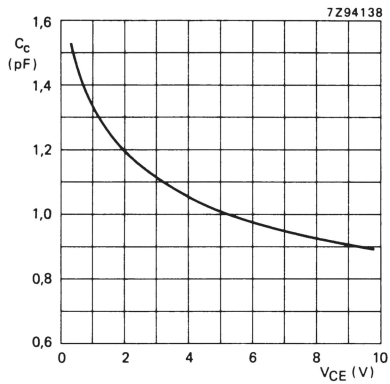


Fig. 6 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

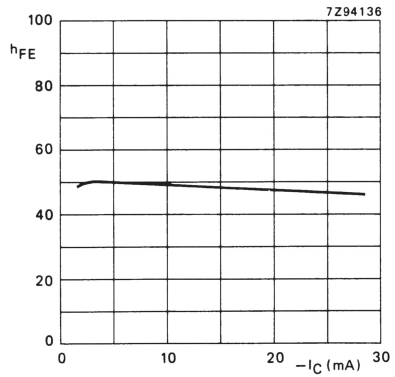


Fig. 7.

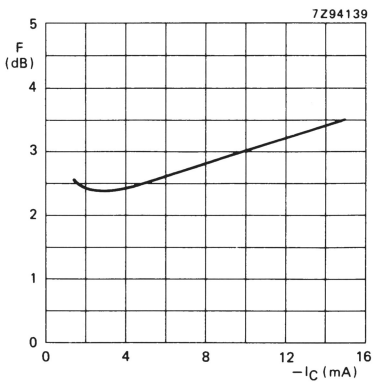


Fig. 8 V_{CE} = 8 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C.

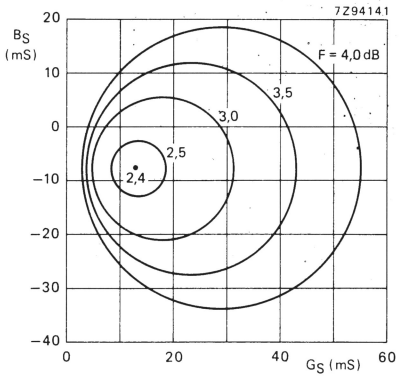


Fig. 9 V_{CE} = 10 V; I_C = 4 mA; f = 800 MHz.

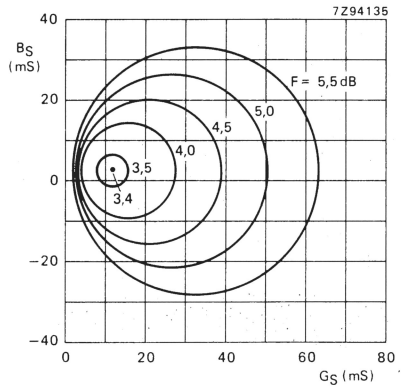


Fig. 10 V_{CE} = 10 V; I_C = 14 mA; f = 800 MHz.

N-P-N 2 GHz WIDEBAND TRANSISTOR

Silicon epitaxial n-p-n transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for wideband application in the GHz range.

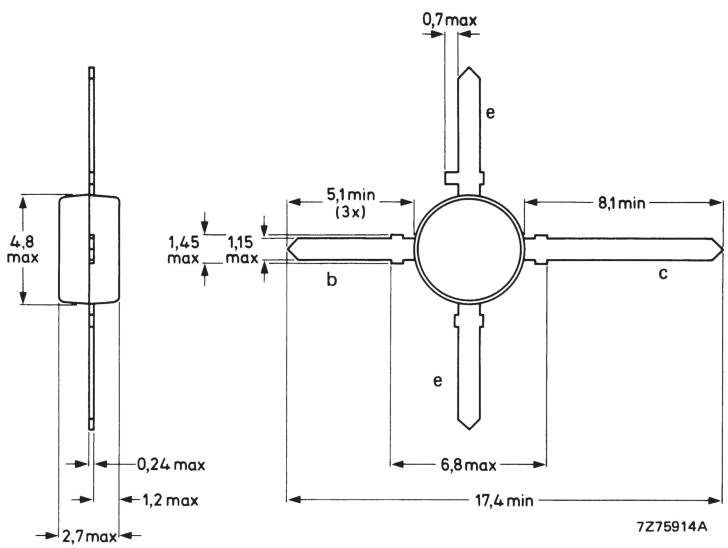
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 °C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min.	60
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Noise figure at Z_S = 60 Ω; I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz	F	typ.	3,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a fibre-glass p.c.b. (see Fig. 2)	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient (free air) mounted on a glass-fibre p.c.b. (see Fig. 2)	$R_{th\ j\text{-}a}$	=	300 K/W

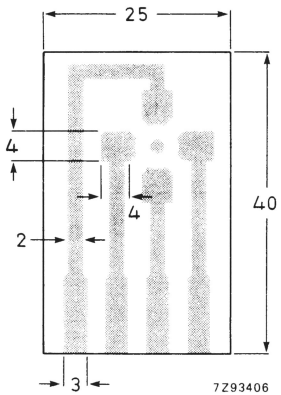


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 5 V	I_{CBO}	max.	50 nA
D.C. current gain * I_C = 15 mA; V_{CE} = 5 V	h_{FE}	typ.	100
Transition frequency at f = 500 MHz * I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 8 V	C_c	typ.	1,1 pF
Emitter capacitance at f = 2 MHz $I_C = i_e$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,3 pF
Feedback capacitance at f = 1 MHz I_E = 0; V_{CB} = 8 V	C_{re}	typ.	0,5 pF

* Measured under pulse conditions.

Maximum unilateral power gain at T_{amb} = 25 °C

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{[1-|s_{ie}|^2]\,[1-|s_{oe}|^2]}$$

I_C = 15 mA; V_{CB} = 8 V; f = 2 GHz	G_{UM}	typ.	10,5 dB
Noise figure at optimum source impedance and V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C;			
I_C = 5 mA	F	typ.	0,8 dB
I_C = 15 mA	F	typ.	1,5 dB
Noise figure at Z_S = 60 Ω and V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C;			
I_C = 5 mA	F	typ.	2,5 dB
I_C = 15 mA	F	typ.	3,0 dB

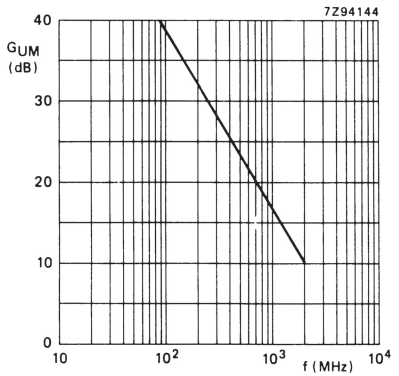


Fig. 3 V_{CE} = 8 V; I_C = 15 mA; T_{amb} = 25 °C

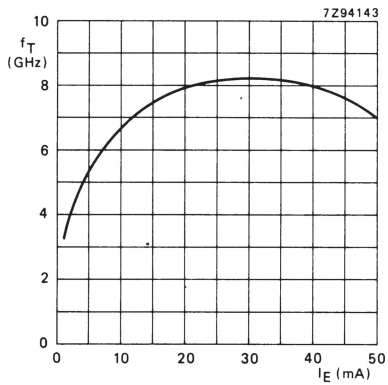


Fig. 4 V_{CE} = 8 V; pulsed condition.

s-parameters (common emitter) at V_{CE} = 8 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,87/ −12,9°	15,83/171,2°	0,01/ 82,0°	0,98/ −6,5°	45,8
	100	0,81/ −31,0°	14,92/155,8°	0,02/ 74,8°	0,93/−15,7°	37,4
	200	0,69/ −54,6°	12,40/138,3°	0,04/ 67,0°	0,83/−25,9°	29,8
5	500	0,42/−105,7°	7,12/104,9°	0,07/ 59,1°	0,59/−40,4°	19,7
	800	0,34/−128,7°	4,89/ 91,3°	0,10/ 63,0°	0,58/−49,1°	16,1
	1000	0,35/−142,8°	4,13/ 83,2°	0,12/ 63,7°	0,58/−58,0°	14,6
	2000	0,25/ 128,0°	2,08/ 56,8°	0,20/ 67,8°	0,38/−63,3°	7,3
	40	0,75/ −19,1°	26,88/165,6°	0,01/ 80,0°	0,96/−10,2°	43,8
	100	0,65/ −43,3°	23,08/144,9°	0,02/ 71,7°	0,86/−22,1°	35,5
	200	0,49/ −70,7°	16,71/125,2°	0,03/ 66,4°	0,70/−31,6°	28,6
10	500	0,28/−126,5°	8,21/ 96,9°	0,06/ 66,4°	0,48/−40,0°	19,8
	800	0,24/−136,7°	5,39/ 86,8°	0,10/ 70,8°	0,50/−48,9°	16,1
	1000	0,26/−147,8°	4,49/ 79,9°	0,12/ 70,5°	0,51/−58,9°	14,6
	2000	0,22/ 114,8°	2,28/ 56,5°	0,21/ 68,8°	0,32/−61,8°	7,8
	40	0,67/ −23,8°	34,23/161,4°	0,01/ 78,3°	0,94/−12,6°	42,9
	100	0,54/ −51,8°	27,41/138,1°	0,02/ 71,0°	0,80/−25,5°	34,7
	200	0,39/ −80,0°	18,52/118,7°	0,03/ 68,4°	0,63/−33,2°	28,2
15	500	0,22/−130,3°	8,47/ 93,5°	0,06/ 70,2°	0,44/−38,8°	19,7
	800	0,20/−140,8°	5,57/ 84,9°	0,10/ 73,6°	0,47/−48,4°	16,2
	1000	0,22/ 147,5°	4,64/ 78,4°	0,12/ 72,9°	0,48/−59,0°	14,7
	2000	0,21/ 109,8°	2,34/ 56,2°	0,22/ 68,7°	0,31/−61,0°	8,0
	40	0,61/ −27,4°	39,76/158,4°	0,01/ 76,8°	0,92/−14,2°	42,4
	100	0,47/ −58,0°	30,05/133,7°	0,02/ 70,4°	0,75/−27,5°	34,2
	200	0,32/ −86,2°	19,38/114,7°	0,03/ 70,4°	0,58/−33,5°	28,0
20	500	0,19/−136,8°	8,65/ 92,0°	0,06/ 72,4°	0,41/−37,5°	19,7
	800	0,18/−145,1°	5,62/ 83,5°	0,10/ 75,3°	0,46/−47,9°	16,1
	1000	0,20/−151,9°	4,63/ 77,7°	0,12/ 74,1°	0,47/−58,8°	14,6
	2000	0,21/−107,3°	2,37/ 55,7°	0,22/ 69,0°	0,30/−60,6°	8,1
	40	0,51/ −33,2°	46,18/154,6°	0,01/ 75,6°	0,89/−16,4°	41,4
	100	0,37/ −67,3°	32,56/128,1°	0,02/ 70,6°	0,69/−29,1°	33,7
	200	0,26/ −97,3°	20,04/110,7°	0,03/ 72,3°	0,53/−32,7°	27,8
30	500	0,17/−151,6°	8,64/ 89,7°	0,06/ 74,6°	0,39/−35,6°	19,6
	800	0,16/−152,2°	5,61/ 82,1°	0,10/ 76,7°	0,44/−46,9°	16,0
	1000	0,19/−157,7°	4,62/ 76,4°	0,12/ 75,1°	0,46/−58,3°	14,5
	2000	0,22/−106,4°	2,37/ 55,0°	0,23/ 69,3°	0,29/−60,0°	8,1

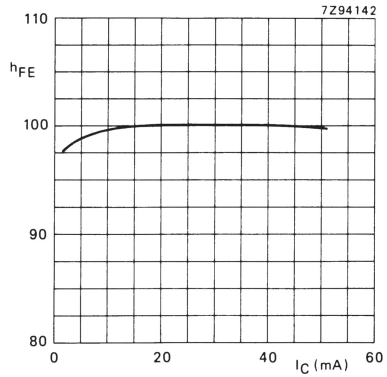


Fig. 5 V_{CE} = 5 V; T_j = 25 °C.

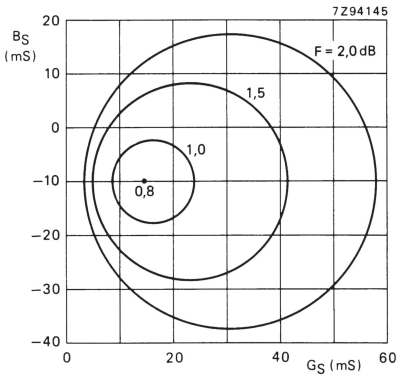


Fig. 6 V_{CE} = 8 V; I_C = 5 mA; f = 800 MHz.

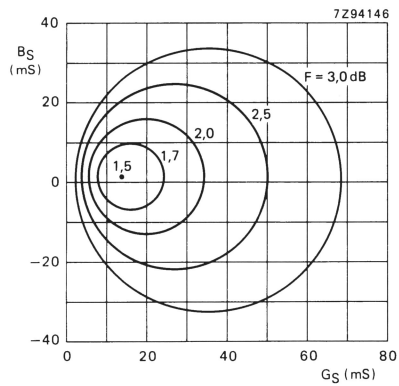


Fig. 7 V_{CE} = 8 V; I_C = 15 mA; f = 800 MHz.

SILICON PLANAR EPITAXIAL TRANSISTOR

Silicon epitaxial n-p-n transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for wideband application in CATV and MATV systems up to 2 GHz.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Junction temperature	T_j	max.	150 °C
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min.	40
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	0,35 pF
Noise figure at Z_S = opt.; T_{amb} = 25 °C; I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz	F	typ.	2,4 dB
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	19 dB
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 14 mA; f = 800 MHz	P_{L1}	typ.	+8 dBm
Third order intercept point V_{CE} = 10 V; I_C = 14 mA; f = 800 MHz	ITO	typ.	+27 dBm

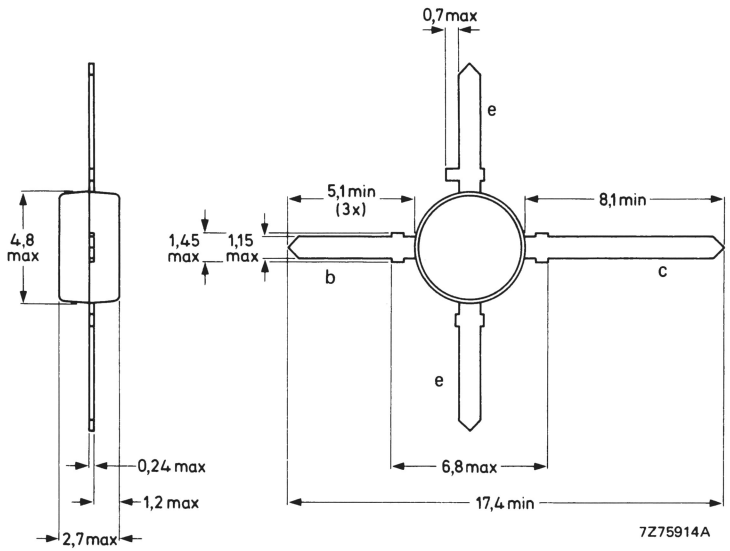
MECHANICAL DATA

SOT-103 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on glass-fibre p.c.b. (see Fig. 2) $R_{th\ j\text{-}a}$ = 500 K/W

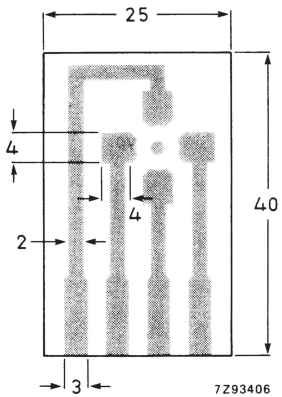


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain *			
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min.	40
		typ.	90
Transition frequency at f = 500 MHz *			
I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz			
$I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,7 pF
Emitter capacitance at f = 1 MHz			
$I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,2 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 10 V	C_{re}	typ.	0,35 pF
Maximum unilateral power gain at T_{amb} = 25 °C			
G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[s_{oe}\rvert^2]}$			
I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz	G_{UM}	typ.	19,0 dB
I_C = 14 mA; V_{CE} = 10 V; f = 2 GHz		typ.	12,0 dB
Noise figure at T_{amb} = 25 °C			
I_C = 4 mA; V_{CE} = 10 V; f = 800 MHz; Z_S = opt.	F	typ.	1,7 dB
I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz; Z_S = opt.	F	typ.	2,4 dB
I_C = 4 mA; V_{CE} = 10 V; f = 2 GHz; R_S = 600 Ω	F	typ.	3,6 dB

* Measured under pulse conditions.

Output power at 1 dB gain compression I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C; R_L = 75 Ω; measured at f = 800 MHz	P_{L1}	typ.	+8 dBm
Third order intercept point (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C; P_p = ITO − 6 dB; f_p = 800 MHz; P_q = ITO − 6 dB; f_q = 801 MHz; measured at $f_{(2q-p)}$ = 802 MHz and at $f_{(2p-q)}$ = 799 MHz	ITO	typ.	+27 dBm
Intermodulation distortion (see Fig. 3) (DIN 45004B, par. 6.3: 3 tone) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_o$ = 150 mV at f_p = 795,25 MHz $V_q = V_o$ − 6 dB at f_q = 803,25 MHz $V_r = V_o$ − 6 dB at f_r = 805,25 MHz measured at $f_{(p+q-r)}$ = 793,25 MHz	d_{im}	typ.	−60 dB
Second harmonic distortion (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_o$ = 60 mV at f_p = 250 MHz $V_q = V_o$ = 60 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−50 dB

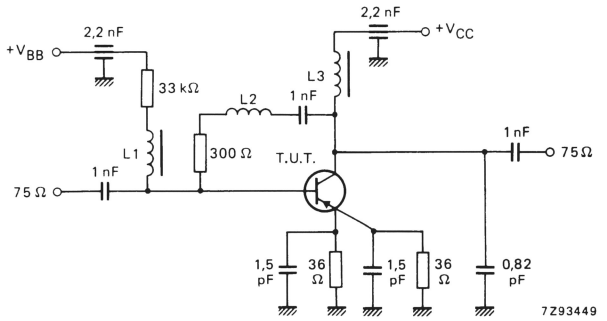


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH Ferroxcube choke
L2 = 3 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,85/ −12,7°	15,11/172,8°	0,01/ 81,8°	1,00/ −5,1°	67,5
	100	0,81/ −29,7°	14,74/160,7°	0,02/ 74,6°	0,97/−11,6°	39,7
	200	0,75/ −54,4°	13,07/145,5°	0,03/ 64,8°	0,90/−19,4°	33,2
5	500	0,57/−109,4°	8,19/112,2°	0,05/ 49,0°	0,69/−33,0°	22,7
	800	0,54/−134,4°	5,82/ 98,5°	0,06/ 49,4°	0,67/−40,5°	19,4
	1000	0,54/−148,3°	4,82/ 90,2°	0,07/ 49,7°	0,65/−47,4°	17,6
	2000	0,57/ 161,5°	2,55/ 64,5°	0,08/ 32,5°	0,48/−61,9°	11,0
	40	0,74/ −18,3°	25,36/169,2°	0,01/ 79,5°	0,99/ −7,33°	48,6
	100	0,69/ −42,7°	23,32/152,8°	0,01/ 70,3°	0,92/−16,1°	38,5
	200	0,61/ −74,4°	18,68/134,7°	0,02/ 60,6°	0,81/−24,9°	32,1
10	500	0,47/−131,0°	10,05/103,8°	0,04/ 53,1°	0,58/−35,6°	22,9
	800	0,46/−151,0°	6,80/ 92,6°	0,05/ 57,5°	0,58/−40,8°	19,4
	1000	0,48/−161,0°	5,63/ 85,5°	0,06/ 59,3°	0,57/−47,9°	17,9
	2000	0,58/ 152,8°	3,00/ 63,0°	0,07/ 41,2°	0,40/−61,3°	12,1
	40	0,67/ −22,3°	30,84/167,5°	0,01/ 77,7°	0,98/ −8,6°	47,4
	100	0,62/ −51,2°	27,70/148,7°	0,01/ 68,3°	0,90/−18,5°	38,0
	200	0,55/ −85,3°	21,21/129,6°	0,02/ 59,3°	0,76/−26,9°	31,8
14	500	0,45/−140,8°	10,63/100,5°	0,03/ 56,1°	0,54/−34,0°	23,0
	800	0,43/−158,2°	7,11/ 90,3°	0,05/ 61,4°	0,54/−40,2°	19,5
	1000	0,45/−165,5°	5,82/ 83,9°	0,06/ 63,0°	0,55/−47,7°	17,8
	2000	0,58/ 150,0°	3,11/ 62,3°	0,07/ 44,7°	0,38/−60,8°	12,3

s-parameters (common emitter) at V_{CE} = 5 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,50/ 51,8°	36,30/137,5°	0,04/ 24,95°	0,96/ 78,0°	43,0
	100	0,49/ 7,8°	30,70/127,3°	0,03/ 41,73°	0,84/ 44,1°	36,5
	200	0,44/ −66,0°	22,16/117,8°	0,03/ 50,90°	0,66/ 1,4°	30,3
	500	0,45/ 163,2°	10,17/ 94,5°	0,04/ 56,43°	0,49/ −4,3°	22,3
20	800	0,44/−177,2°	7,07/ 81,6°	0,06/ 62,48°	0,48/−13,3°	19,1
	1000	0,46/ 177,0°	5,43/ 76,7°	0,06/ 64,80°	0,45/−16,7°	16,7
	1200	0,48/ 164,6°	4,32/ 75,9°	0,07/ 66,40°	0,44/−27,0°	14,8
	1500	0,46/ 165,0°	3,28/ 76,1°	0,07/ 78,93°	0,41/−36,0°	12,1
	2000	0,46/ 138,1°	2,83/ −0,7°	0,10/ 28,73°	0,37/−78,4°	10,8
	40	0,39/ 29,7°	39,21/136,2°	0,04/ 27,95°	0,90/ 76,2°	39,7
	100	0,42/ −24,3°	29,02/119,3°	0,03/ 39,25°	0,75/ 45,8°	33,7
	200	0,44/ −84,6°	18,43/110,5°	0,03/ 44,18°	0,61/ 8,9°	28,3
	500	0,50/−176,3°	7,77/ 90,5°	0,04/ 63,35°	0,54/ −0,1°	20,5
30	800	0,49/ 176,8°	5,33/ 79,5°	0,06/ 69,50°	0,52/ −6,7°	17,1
	1000	0,52/ 171,2°	4,17/ 76,0°	0,06/ 70,78°	0,52/−14,8°	15,1
	1200	0,54/ 161,3°	3,36/ 73,8°	0,06/ 70,50°	0,51/−26,1°	13,4
	1500	0,49/ 159,4°	2,52/ 75,9°	0,07/ 84,08°	0,46/−25,0°	10,2
	2000	0,54/ 134,0°	2,17/ −1,4°	0,10/ 34,28°	0,42/−80,7°	9,1

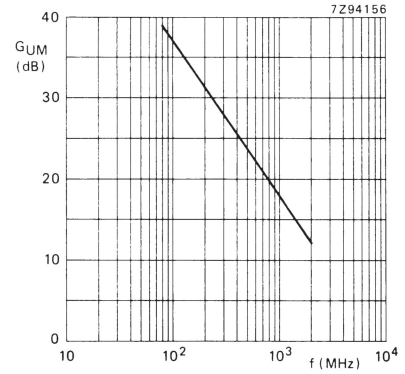


Fig. 4 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

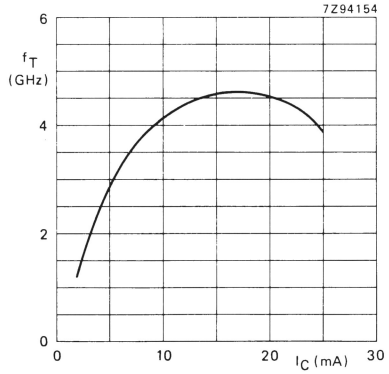


Fig. 5 V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C.

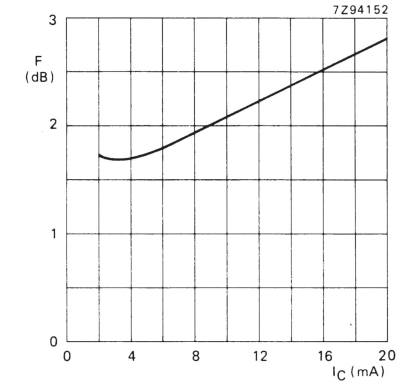


Fig. 6 V_{CE} = 10 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C.

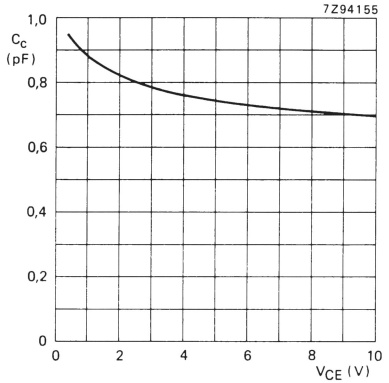


Fig. 7 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

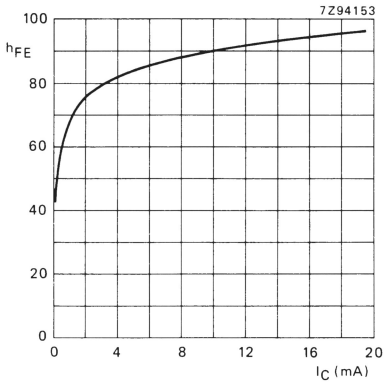


Fig. 8 V_{CE} = 5 V.

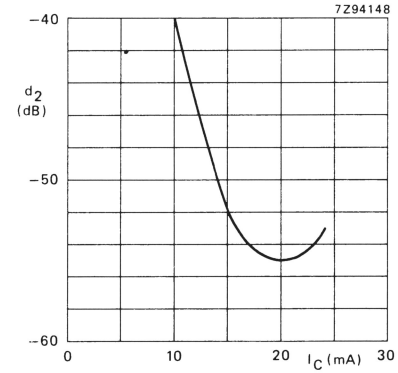


Fig. 9 V_{CE} = 10 V; V_o = 60 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C.

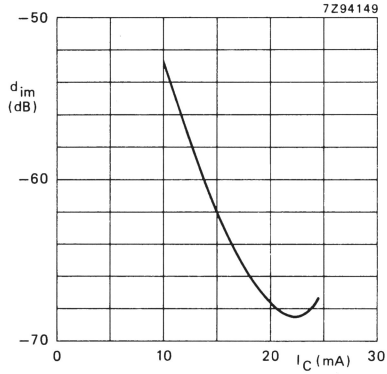


Fig. 10 V_{CE} = 10 V; V_o = 150 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C.

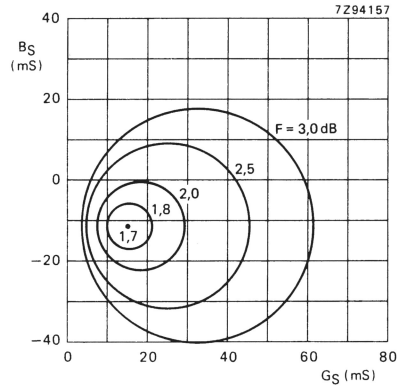


Fig. 11 Circle of constant noise figure; I_C = 4 mA; V_{CE} = 10 V; f = 800 MHz.

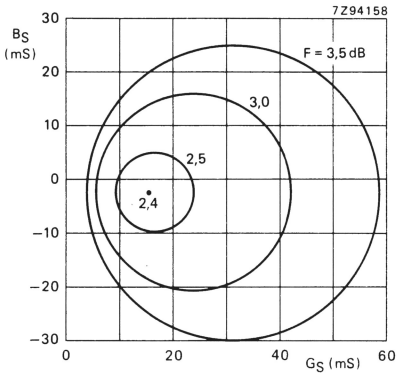


Fig. 12 Circle of constant noise figure; I_C = 14 mA; V_{CE} = 10 V; f = 800 MHz.

CLASS-B OPERATION

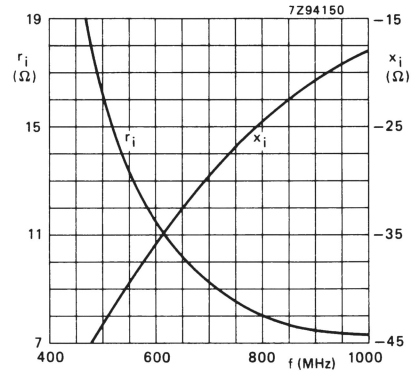


Fig. 13 Input impedance (series components).

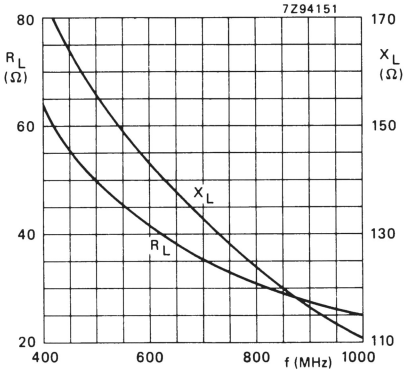


Fig. 14 Load impedance (series components).

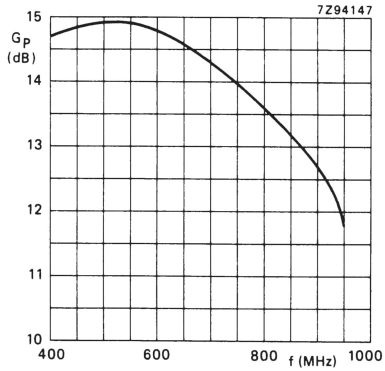


Fig. 15 Power gain versus frequency.

Conditions for Figs 13 to 15:

V_{CE} = 10 V; P_L = 100 mW; T_{amb} = 25 °C.

OPERATING NOTE for Figs 13 to 15:

A base-emitter resistor of 82 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

SILICON PLANAR EPITAXIAL TRANSISTOR

Silicon epitaxial n-p-n transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for wideband application in CATV and MATV systems up to 2 GHz.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Junction temperature	T_j	max.	150 °C
D.C. current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min.	40
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 4 V	C_{re}	typ.	0,5 pF
Noise figure at optimum source impedance I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz	F	typ.	2,3 dB
Maximum unilateral power gain at f = 800 MHz I_C = 30 mA; V_{CE} = 8 V	G_{UM}	typ.	16,5 dB
Output power at 1 dB gain compression V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz	P_{L1}	typ.	+17 dBm
Third order intercept point V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz	ITO	typ.	+36 dBm

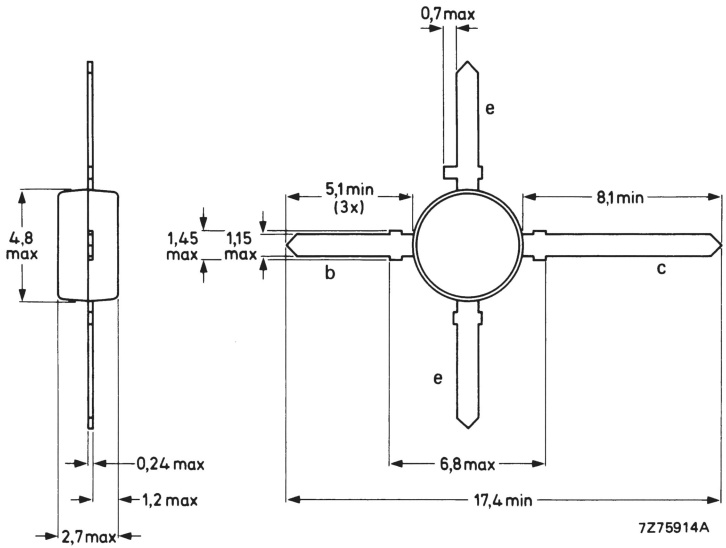
MECHANICAL DATA

SOT-103 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current			
d.c.	I_C	max.	35 mA
peak value; f > 1 MHz	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on glass-fibre p.c.b. (see Fig. 2)

$R_{th\ j\text{-}a}$ = 300 K/W

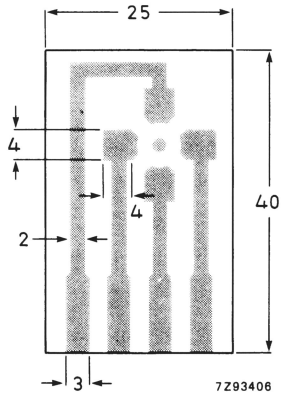


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 5 V	I_{CBO}	max.	50 nA
D.C. current gain * I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz * I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6 GHz
Collector output capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 5 V	C_{oe}	typ.	0,9 pF
Emitter capacitance at f = 1 MHz $I_C = i_e$ = 0; V_{CB} = 0,5 V	C_e	typ.	2,5 pF
Feedback capacitance at f = 1 MHz I_E = 0; V_{CE} = 4 V	C_{re}	typ.	0,5 pF
Maximum unilateral power gain at T_{amb} = 25 °C G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2][1-\lvert s_{oe}\rvert^2]}$			
I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz I_C = 30 mA; V_{CE} = 8 V; f = 2 GHz	G_{UM}	typ. typ.	16,5 dB 8,0 dB
Noise figure at optimum source impedance V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C I_C = 4 mA I_C = 30 mA	F	typ. typ.	1,6 dB 2,3 dB

* Measured under pulse conditions.

Output power at 1 dB gain compression V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C; R_L = 75 Ω; measured at f = 800 MHz	P_{L1}	typ.	+17 dBm
Third order intercept point (see Fig. 3) I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C; P_p = ITO − 6 dB; f_p = 800 MHz; P_q = ITO − 6 dB; f_q = 801 MHz; measured at $f_{(2q-p)}$ = 802 MHz and at $f_{(2p-q)}$ = 799 MHz	ITO	typ.	+36 dBm
Intermodulation distortion (see Fig. 3) (DIN 45004B, par. 6.3: 3 tone) V_{CE} = 8 V; I_C = 30 mA; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_o$ = 425 mV at f_p = 795,25 MHz $V_q = V_o$ − 6 dB at f_q = 803,25 MHz $V_r = V_o$ − 6 dB at f_r = 805,25 MHz measured at $f_{(p+q-r)}$ = 793,25 MHz	d_{im}	typ.	−60 dB
Second harmonic distortion (see Fig. 3) V_{CE} = 8 V; I_C = 30 mA; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_o$ = 200 mV at f_p = 250 MHz $V_q = V_o$ = 200 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−50 dB

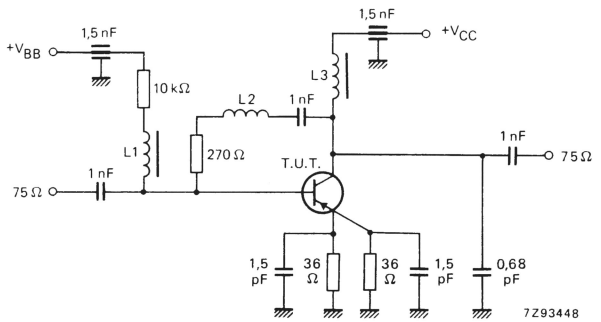


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH Ferroxcube choke
L2 = 3 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm

s-parameters (common emitter) at V_{CE} = 8 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,90/ −14,5°	7,12/173,2°	0,01/ 81,7°	1,00/ −4,3°	49,1
	100	0,88/ −36,4°	6,86/159,1°	0,03/ 71,4°	0,97/−10,1°	35,8
	200	0,84/ −66,1°	6,06/143,2°	0,05/ 58,0°	0,91/−17,1°	28,6
2	500	0,73/−125,1°	3,69/108,6°	0,07/ 34,0°	0,74/−29,5°	18,1
	800	0,73/−153,5°	2,65/ 93,0°	0,08/ 28,6°	0,72/−37,9°	15,0
	1000	0,74/−168,6°	2,20/ 83,2°	0,08/ 26,8°	0,72/−45,7°	13,5
	1200	0,72/−176,7°	1,77/ 75,3°	0,07/ 28,6°	0,64/−51,2°	10,5
	2000	0,68/ 166,5°	1,01/ 51,8°	0,06/ 53,9°	0,65/−50,8°	5,2
	40	0,77/ −21,9°	15,58/169,8°	0,01/ 79,4°	0,99/ −7,4°	44,6
	100	0,74/ −51,1°	14,29/152,3°	0,02/ 66,4°	0,93/−16,8°	35,1
	200	0,71/ −87,4°	11,42/133,7°	0,04/ 52,6°	0,80/−26,4°	28,5
5	500	0,63/−145,5°	6,05/102,1°	0,05/ 38,3°	0,56/−35,6°	19,5
	800	0,64/−168,8°	4,12/ 89,4°	0,06/ 40,9°	0,55/−42,8°	16,2
	1000	0,65/−179,7°	3,37/ 81.3°	0,06/ 43,3°	0,54/−50,6°	14,4
	1200	0,67/ 166,6°	2,79/ 75,6°	0,06/ 48,6°	0,46/−53,6°	12,5
	2000	0,63/ 161,5°	1,52/ 54,0°	0,08/ 64,6°	0,48/−50,6°	7,0
	40	0,61/ −31,68°	26,14/165,8°	0,01/ 75,9°	0,98/−11,2°	43,5
	100	0,60/ −70,85°	22,34/144,7°	0,02/ 62,3°	0,86/−24,3°	34,6
	200	0,60/−110,6°	16,32/124,5°	0,03/ 50,4°	0,67/−34,9°	28,8
10	500	0,59/−161,7°	7,80/ 97,4°	0,04/ 47,2°	0,42/−40,1°	20,5
	800	0,59/−178,3°	5,12/ 86,6°	0,05/ 54,0°	0,42/−46,8°	16,9
	1000	0,60/ 172,9°	4,14/ 79,7°	0,06/ 57,1°	0,42/−55,3°	15,1
	1200	0,63/ 160,3°	3,42/ 75,7°	0,07/ 61,8°	0,34/−56,5°	13,4
	2000	0,59/ 157,8°	1,88/ 55,3°	0,09/ 68,9°	0,37/−51,8°	8,0
	40	0,44/ −49,2°	39,09/160,4°	0,01/ 72,2°	0,95/−16,1°	42,6
	100	0,49/ −97,6°	30,79/136,0°	0,02/ 59,1°	0,76/−42,6°	34,7
	200	0,53/−134,7°	20,31/116,6°	0,02/ 52,5°	0,54/−42,6°	29,1
20	500	0,57/−173,5°	9,05/ 33,9°	0,04/ 58,5°	0,32/−43,6°	21,3
	800	0,56/ 173,5°	5,88/ 84,6°	0,05/ 65,3°	0,33/−50,1°	17,5
	1000	0,57/ 167,0°	4,69/ 78,6°	0,06/ 67,0°	0,33/−59,9°	15,6
	1200	0,62/ 154,2°	3,88/ 74,9°	0,07/ 70,1°	0,24/−60,4°	14,2
	2000	0,57/ 155,0°	2,13/ 56,3°	0,10/ 71,5°	0,28/−54,2°	8,7
	40	0,36/ −64,5°	46,45/157,6°	0,01/ 71,7°	0,92/−18,6°	42,3
	100	0,46/−113,9°	34,54/132,0°	0,01/ 59,1°	0,70/−36,5°	34,8
	200	0,52/−145,9°	21,76/113,4°	0,02/ 55,9°	0,48/−45,5°	29,3
30	500	0,56/−178,5°	9,48/ 92,7°	0,03/ 63,8°	0,28/−44,2°	21,5
	800	0,55/−170,1°	6,15/ 84,2°	0,05/ 70,0°	0,30/−51,0°	17,8
	1000	0,57/−164,8°	4,19/ 78,6°	0,06/ 70,9°	0,30/−61,5°	15,9
	1200	0,62/−152,7°	4,07/ 75,8°	0,07/ 73,6°	0,21/−61,3°	14,4
	2000	0,57/−153,8°	2,22/ 56,3°	0,10/ 72,5°	0,25/−55,4°	8,9

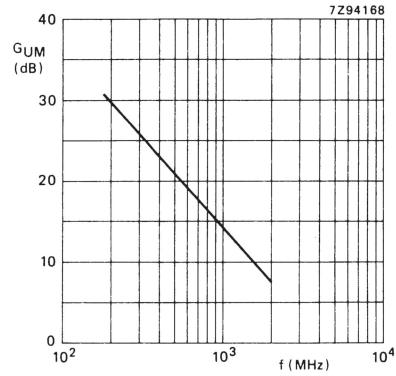


Fig. 4 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

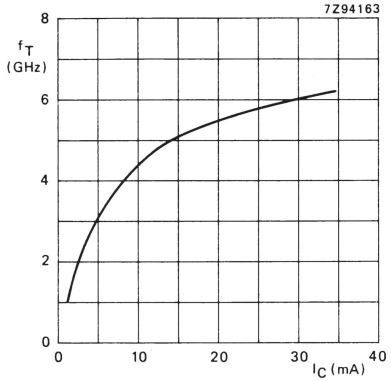


Fig. 5 V_{CE} = 8 V; f = 500 MHz; T_{amb} = 25 °C.

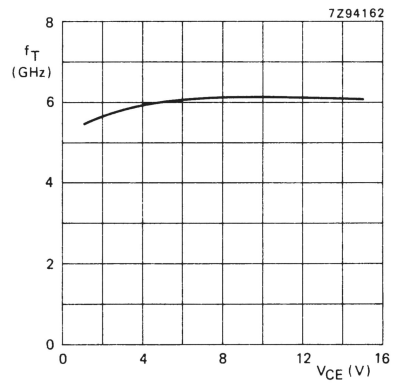


Fig. 6 I_C = 30 mA; f = 500 MHz; T_{amb} = 25 °C.

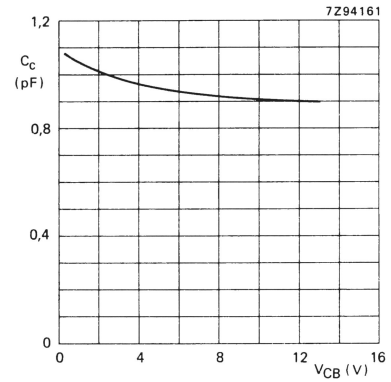


Fig. 7 $I_E = i_e$ = 0; f = 1 MHz; T_{amb} = 25 °C.

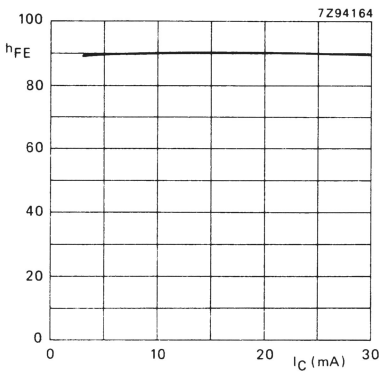


Fig. 8 V_{CE} = 5 V; T_{amb} = 25 °C.

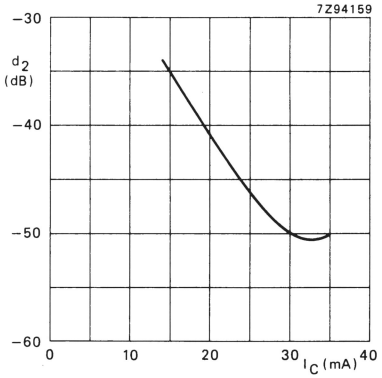


Fig. 9 V_{CE} = 8 V; V_o = 200 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C.

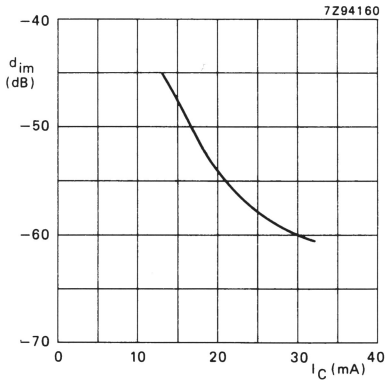


Fig. 10 V_{CE} = 8 V; V_o = 425 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C.

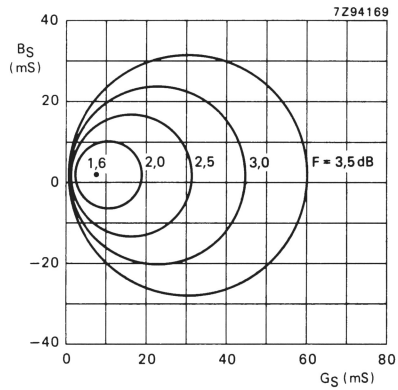


Fig. 11 Circle of constant noise figure; I_C = 4 mA; V_{CE} = 8 V; f = 800 MHz.

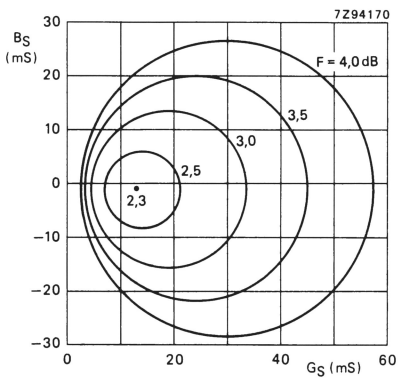


Fig. 12 Circle of constant noise figure; I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz.

CLASS-B OPERATION

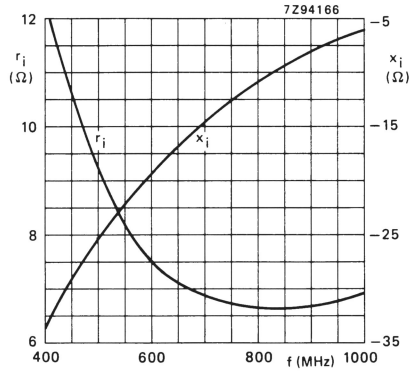


Fig. 13 Input impedance (series components).

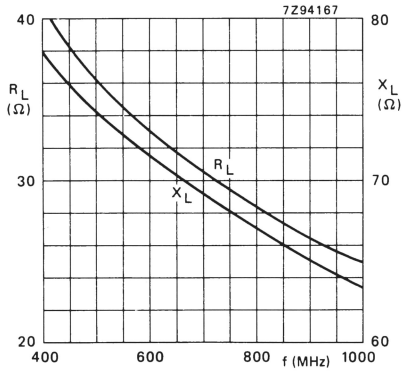


Fig. 14 Load impedance (series components).

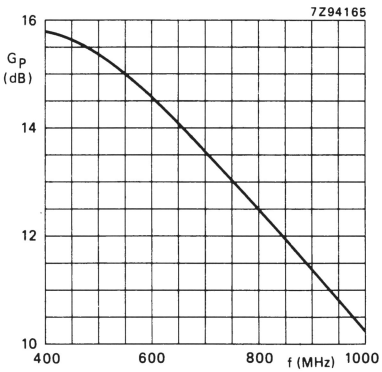


Fig. 15 Power gain versus frequency.

Conditions for Figs 13 to 15:

V_{CE} = 7,5 V; P_L = 160 mW; T_{amb} = 25 °C.

OPERATING NOTE for Figs 13 to 15:

A base-emitter resistor of 82 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

SILICON PLANAR EPITAXIAL TRANSISTOR

Silicon epitaxial n-p-n transistor in a four-lead dual-emitter plastic envelope (SOT-103). This device is designed for wideband application in CATV and MATV systems up to 2 GHz.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CB} = 10 V	C_{re}	typ.	1,0 pF
Maximum unilateral power gain at f = 800 MHz I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_{UM}	typ.	17 dB
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz	P_{L1}	typ.	+21 dBm
Third order intercept point V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz	ITO	typ.	+40 dBm

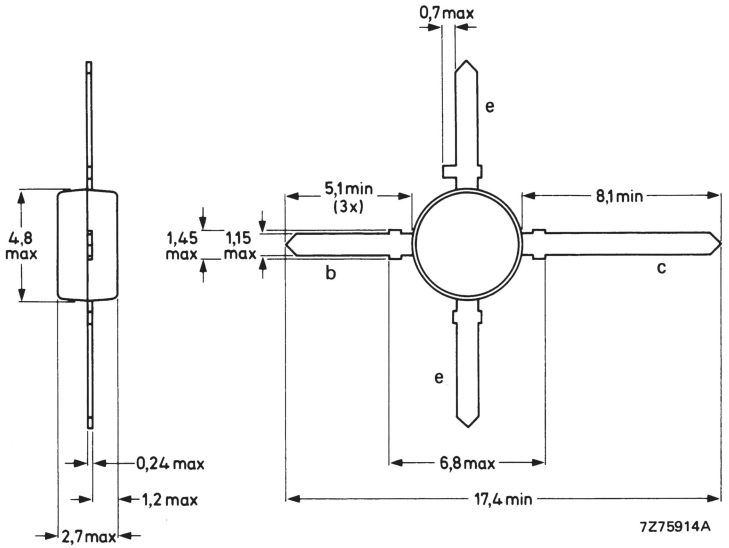
MECHANICAL DATA

SOT-103 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{amb} = 70 °C mounted on a p.c. board (see Fig. 2)	P_{tot}	max.	700 mW
Storage temperature	T_{stg}		−65 to +175 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on glass-fibre p.c.b. (see Fig. 2)	$R_{th\ j\text{-}a}$	=	150 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	75 K/W

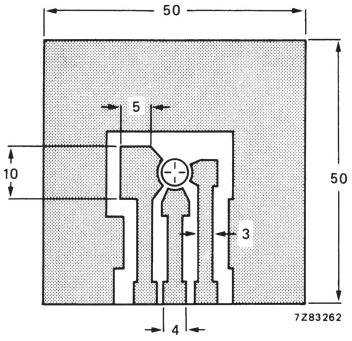


Fig. 2 Requirements for fibre-glass print (dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	100 nA
D.C. current gain * I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min. typ.	25 50
Transition frequency at f = 500 MHz * I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,5 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	6,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1,0 pF
Maximum unilateral power gain at T_{amb} = 25 °C G_{UM} (in dB) = 10 log $\frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$			
I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz I_C = 50 mA; V_{CE} = 10 V; f = 2 GHz	G_{UM}	typ. typ.	15,0 dB 8,0 dB

* Measured under pulse conditions.

Output power at 1 dB gain compression I_C = 70 mA; V_{CE} = 10 V; T_{amb} = 25 °C; R_L = 75 Ω; measured at f = 800 MHz	P_{L1}	typ.	+21 dBm
Third order intercept point (see Fig. 3) I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C; P_p = ITO − 6 dB; f_p = 800 MHz; P_q = ITO − 6 dB; f_q = 801 MHz; measured at $f_{(2q-p)}$ = 802 MHz and at $f_{(2p-q)}$ = 799 MHz	ITO	typ.	+40 dBm
Intermodulation distortion (see Fig. 3) (DIN 45004B, par. 6.3: 3 tone) I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_o$ = 700 mV at f_p = 795,25 MHz $V_q = V_o$ − 6 dB at f_q = 803,25 MHz $V_r = V_o$ − 6 dB at f_r = 805,25 MHz measured at $f_{(p+q-r)}$ = 793,25 MHz	d_{im}	typ.	−60 dB
Second harmonic distortion (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C $V_p = V_o$ = 316 mV at f_p = 250 MHz $V_q = V_o$ = 316 mV at f_q = 560 MHz measured at $f_{(p+q)}$ = 810 MHz	d_2	typ.	−52 dB

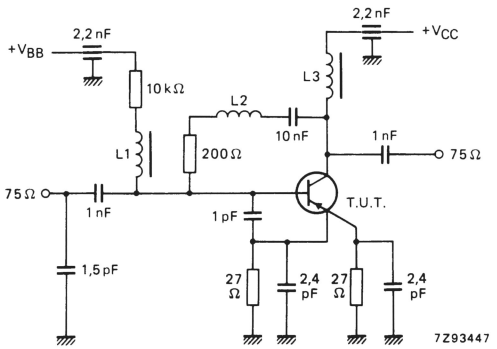


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH micro-choke
L2 = 1,5 turns Cu wire (0,4 mm), internal diameter 3 mm, winding pitch 1 mm.

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
	40	0,75/ 33,1°	25,61/136,3°	0,04/ 45,38°	0,91/ 50,9°	39,2
	100	0,72/ −17,9°	18,62/115,2°	0,04/ 40,38°	0,66/ 29,7°	31,0
	200	0,69/ −90,1°	12,47/105,3°	0,05/ 36,90°	0,45/ −21,4°	25,7
	500	0,71/ 176,5°	4,90/ 83,0°	0,06/ 38,38°	0,27/ −23,5°	17,1
10	800	0,72/ 171,3°	3,40/ 69,6°	0,08/ 48,45°	0,28/ −36,2°	14,1
	1000	0,71/ 166,8°	2,56/ 65,2°	0,08/ 49,95°	0,26/ −46,7°	11,5
	1200	0,74/ 155,3°	2,10/ 61,6°	0,08/ 55,93°	0,25/ −46,3°	10,2
	1500	0,78/ 145,4°	2,02/ 39,0°	0,10/ 61,78°	0,26/−159,4°	10,5
	2000	0,73/ 126,5°	1,34/ −6,1°	0,13/ 7,60°	0,26/−114,5°	6,2
	40	0,66/ 23,3°	34,19/132,7°	0,04/ 42,88°	0,88/ 45,6°	39,5
	100	0,67/ −26,5°	22,57/112,9°	0,04/ 38,10°	0,56/ 21,9°	31,3
	200	0,67/ −86,1°	14,26/102,0°	0,05/ 40,90°	0,36/ −33,4°	26,3
	500	0,70/ 176,3°	5,48/ 82,9°	0,06/ 45,18°	0,19/ −38,1°	17,9
15	800	0,71/ 168,4°	3,78/ 69,0°	0,08/ 55,43°	0,20/ −50,5°	14,8
	1000	0,72/ 164,6°	2,85/ 65,6°	0,08/ 57,48°	0,18/ −53,2°	12,4
	1200	0,74/ 152,8°	2,32/ 62,5°	0,09/ 60,28°	0,17/ −37,5°	10,8
	1500	0,77/ 146,1°	2,28/ 41,4°	0,10/ 65,25°	0,19/−123,1°	11,3
	2000	0,72/ 125,7°	1,51/ −5,0°	0,14/ 7,05°	0,20/−128,2°	7,0
	40	0,62/ 13,9°	40,59/131,8°	0,04/ 38,98°	0,83/ 39,1°	39,2
	100	0,65/ −37,5°	25,03/109,5°	0,04/ 36,05°	0,51/ 15,4°	31,7
	200	0,67/ −68,6°	15,43/100,8°	0,04/ 40,80°	0,31/ −42,1°	26,8
	500	0,70/ 176,1°	5,75/ 81,7°	0,06/ 49,53°	0,16/ −51,9°	18,2
20	800	0,72/ 166,2°	4,03/ 69,3°	0,08/ 55,80°	0,17/ −53,0°	15,4
	1000	0,69/ 164,1°	3,02/ 66,4°	0,08/ 59,05°	0,15/ −36,3°	12,5
	1200	0,73/ 150,9°	2,47/ 63,5°	0,09/ 62,18°	0,14/ 117,9°	11,2
	1500	0,75/ 145,1°	2,38/ 41,3°	0,11/ 66,45°	0,16/−126,5°	11,3
	2000	0,72/ 125,3°	1,59/ −5,0°	0,14/ 9,28°	0,17/−140,5°	7,3
	40	0,55/ −2,1°	50,00/128,5°	0,04/ 35,50°	0,78/ 32,5°	39,5
	100	0,64/ −40,8°	28,09/106,5°	0,03/ 34,85°	0,44/ 4,1°	32,2
	200	0,65/ 6,1°	16,77/ 97,9°	0,04/ 45,58°	0,25/ −54,3°	27,2
	500	0,69/−179,8°	6,15/ 81,8°	0,05/ 54,00°	0,15/ −55,1°	18,7
30	800	0,70/ 166,9°	4,25/ 70,1°	0,08/ 60,45°	0,16/ −1,9°	15,6
	1000	0,70/ 163,8°	3,21/ 67,2°	0,08/ 63,18°	0,13/ 165,1°	13,1
	1200	0,73/ 151,2°	2,61/ 64,2°	0,09/ 66,68°	0,12/−151,3°	11,7
	1500	0,75/ 141,4°	2,56/ 43,3°	0,12/ 67,53°	0,15/−142,5°	11,8
	2000	0,71/ 126,0°	1,69/ −4,1°	0,15/ 10,45°	0,16/−159,5°	7,8
	40	0,51/ −21,9°	59,01/124,0°	0,04/ 32,05°	0,69/ 25,6°	39,5
	100	0,64/ −36,4°	30,20/103,2°	0,03/ 38,98°	0,36/ −7,1°	32,5
	200	0,65/ 128,6°	17,42/ 95,4°	0,04/ 47,90°	0,22/ −67,7°	27,5
	500	0,70/ 178,8°	6,39/ 80,9°	0,05/ 62,15°	0,15/ 8,8°	19,1
50	800	0,72/ 166,9°	4,41/ 68,1°	0,08/ 64,15°	0,16/ 149,9°	16,2
	1000	0,69/ 162,0°	3,31/ 67,7°	0,08/ 65,10°	0,14/−164,5°	13,3
	1200	0,73/ 151,5°	2,72/ 65,2°	0,09/ 68,25°	0,13/−163,0°	12,0
	1500	0,75/ 144,3°	2,60/ 43,1°	0,12/ 69,60°	0,15/−158,3°	11,9
	2000	0,71/ 124,5°	1,76/ −2,2°	0,15/ 10,13°	0,16/−175,0°	8,1

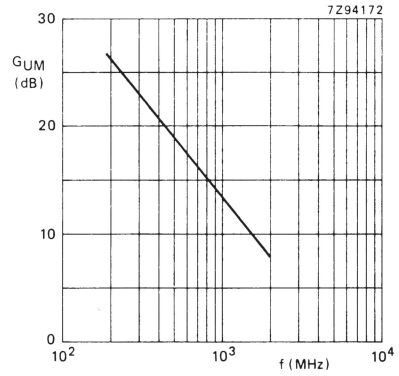


Fig. 4 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C.

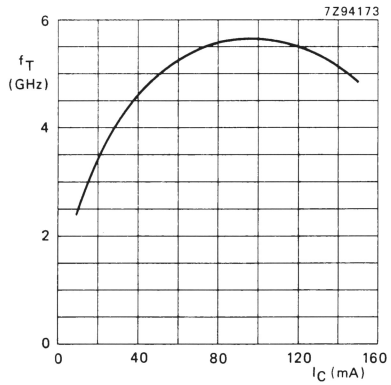


Fig. 5 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C

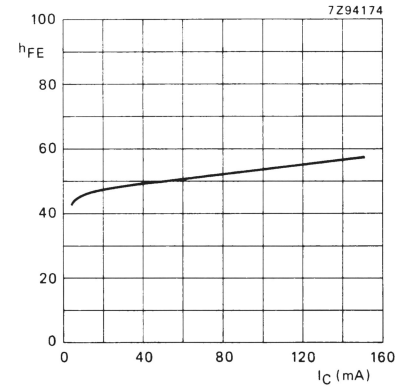


Fig. 6 V_{CE} = 10 V; T_{amb} = 25 °C.

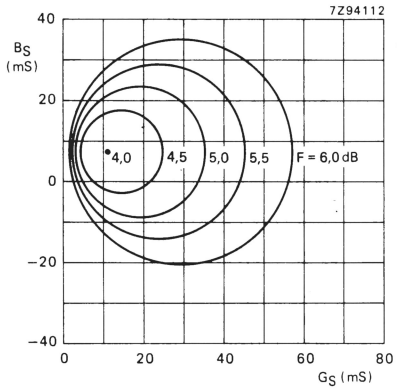


Fig. 7 Circle of constant noise figure I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz.

CLASS-B OPERATION

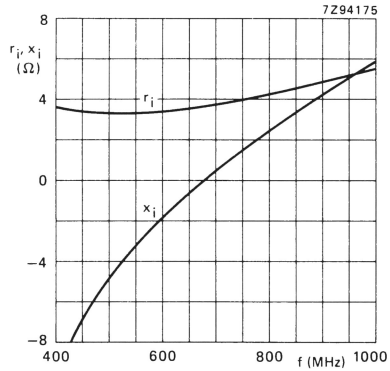


Fig. 8 Input impedance (series components).

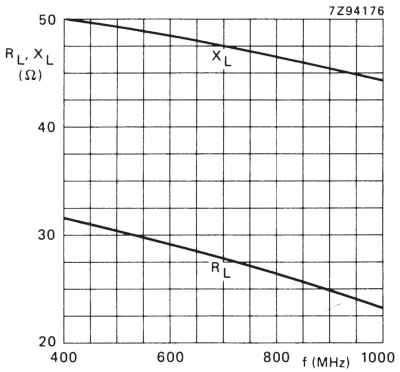


Fig. 9 Load impedance (series components).

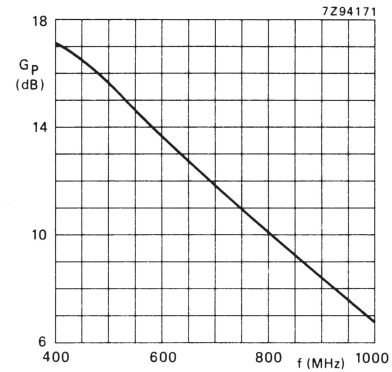


Fig. 10 Power gain versus frequency.

Conditions for Figs 8 to 10:

V_{CE} = 10 V; P_L = 700 mW; T_{amb} = 25 °C

OPERATING NOTE for Figs 8 to 10:

A resistance of 39 Ω between base and emitter is recommended to avoid oscillation. This resistance must be effective for r.f. only.

N-P-N 1 GHZ BROADBAND TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP90A features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

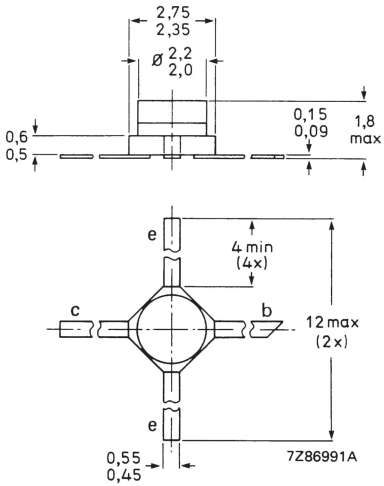
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	30	mA
Total power dissipation up to T_{amb} = 125 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	175	°C
D.C. current gain I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 90	
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5,0	GHz
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C at f = 500 MHz at f = 800 MHz	G_{UM}	typ. typ.	23 19	dB dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.



Marking code: P0

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	30 mA
Total power dissipation up to T_{amb} = 125 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain* I_C = 14 mA; V_{CE} = 10 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz* I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5,0 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,5 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,2 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	0,3 pF
Maximum unilateral power gain (s_{re} assumed to be zero) $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$ at I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C			
f = 500 MHz	G_{UM}	typ.	23 dB
f = 800 MHz	G_{UM}	typ.	19 dB
Noise figure at f = 800 MHz; R_S = opt.; T_{amb} = 25 °C			
I_C = 4 mA; V_{CE} = 10 V	F	typ.	1,7 dB
I_C = 14 mA; V_{CE} = 10 V	F	typ.	2,4 dB

* Measured under pulse conditions.

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,89/– 8,4°	7,0/174,9°	0,006/83,5°	0,99/– 2,3°
	100	0,88/– 20,8°	6,9/167,0°	0,015/79,6°	0,98/– 5,4°
	200	0,84/– 40,7°	6,6/154,0°	0,028/70,2°	0,95/–10,2°
2	500	0,72/– 87,4°	5,0/126,0°	0,053/51,7°	0,86/–19,6°
	800	0,64/–116,6°	3,7/107,3°	0,063/43,9°	0,81/–24,9°
	1000	0,59/–132,4°	3,1/ 98,1°	0,066/42,4°	0,79/–27,8°
	1200	0,56/–145,7°	2,7/ 90,6°	0,068/41,1°	0,77/–30,4°
	40	0,78/– 12,7°	14,8/172,3°	0,006/81,4°	0,98/– 3,7°
	100	0,76/– 30,9°	14,0/160,8°	0,014/75,3°	0,96/– 8,8°
	200	0,70/– 58,3°	12,4/144,1°	0,024/64,9°	0,89/–15,1°
5	500	0,58/–112,1°	7,8/114,7°	0,040/50,6°	0,74/–23,5°
	800	0,52/–138,8°	5,5/ 98,5°	0,048/50,1°	0,69/–26,4°
	1000	0,49/–153,6°	4,4/ 91,2°	0,052/51,7°	0,67/–28,5°
	1200	0,48/–163,4°	3,8/ 84,5°	0,056/53,2°	0,66/–30,5°
	40	0,65/– 18,3°	23,5/169,2°	0,005/79,9°	0,98/– 5,4°
	100	0,63/– 43,4°	21,5/154,2°	0,012/71,9°	0,93/–12,3°
	200	0,56/– 78,1°	17,4/134,5°	0,020/61,1°	0,82/–19,0°
10	500	0,49/–132,4°	9,5/107,0°	0,032/54,4°	0,65/–24,0°
	800	0,46/–154,9°	6,4/ 93,3°	0,041/58,0°	0,62/–26,1°
	1000	0,44/–167,1°	5,1/ 87,4°	0,047/60,6°	0,61/–27,6°
	1200	0,44/–174,8°	4,3/ 81,7°	0,052/62,5°	0,60/–29,7°
	40	0,52/– 28,1°	33,9/164,9°	0,005/77,6°	0,96/– 7,5°
	100	0,50/– 64,1°	29,3/145,4°	0,011/67,4°	0,88/–15,5°
	200	0,46/–104,5°	21,0/124,4°	0,016/59,7°	0,73/–20,8°
20	500	0,46/–150,2°	10,3/101,0°	0,026/61,4°	0,60/–22,1°
	800	0,44/–165,7°	6,7/ 89,7°	0,037/66,1°	0,58/–23,9°
	1000	0,44/–175,7°	5,4/ 84,2°	0,044/68,6°	0,58/–25,7°
	1200	0,44/+ 178,5°	4,5/ 79,6°	0,050/69,8°	0,57/–27,9°
	40	0,48/– 33,4°	36,8/162,7°	0,005/75,8°	0,95/– 8,2°
	100	0,47/– 72,9°	30,3/141,7°	0,010/65,2°	0,85/–16,2°
	200	0,45/–113,4°	21,0/121,1°	0,015/59,4°	0,71/–20,2°
25	500	0,45/–156,0°	9,9/ 99,1°	0,025/62,9°	0,60/–20,8°
	800	0,45/–170,1°	6,5/ 88,1°	0,036/67,9°	0,58/–23,1°
	1000	0,44/–179,1°	5,2/ 83,2°	0,043/69,9°	0,58/–25,0°
	1200	0,44/+ 175,4°	4,3/ 78,9°	0,050/71,2°	0,58/–27,4°

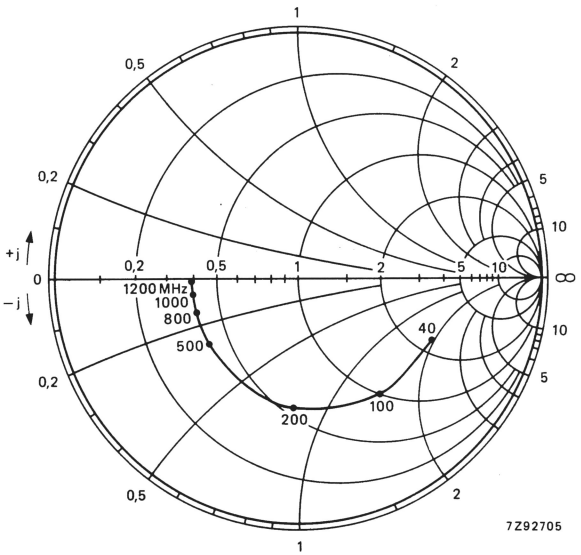


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in Ω x 50.

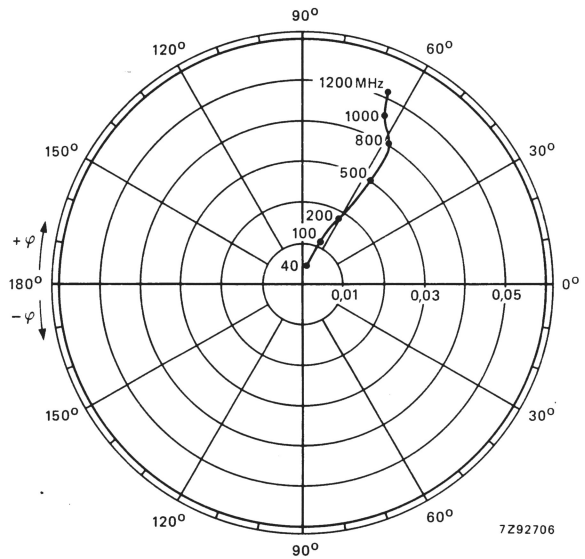


Fig. 3 Reverse transmission coefficient s_{re}.

Conditions for Figs 2 to 5: V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

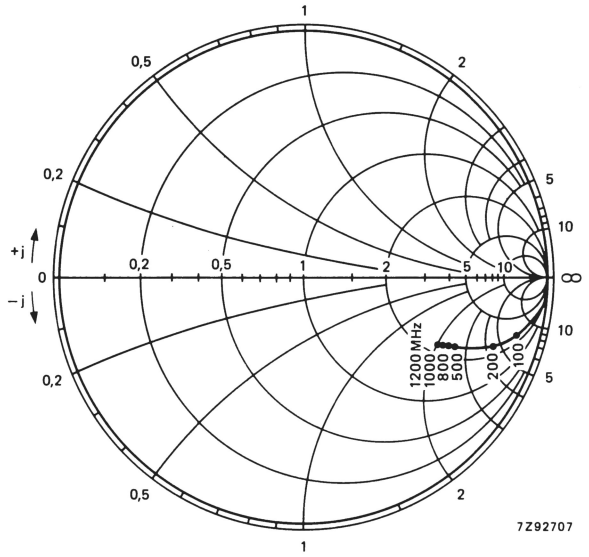


Fig. 4 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in Ω x 50.

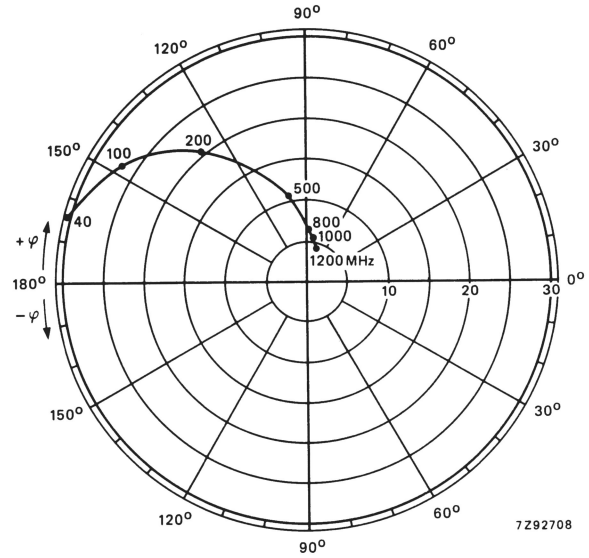


Fig. 5 Forward transmission coefficient s_{fe}.

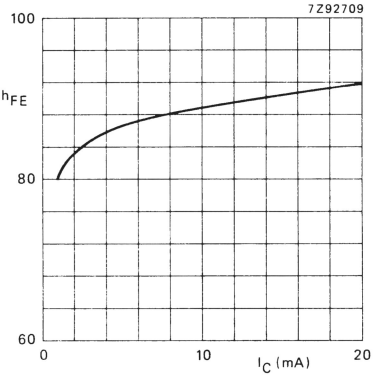


Fig. 6 V_{CE} = 10 V; T_j = 25 °C; typical values.

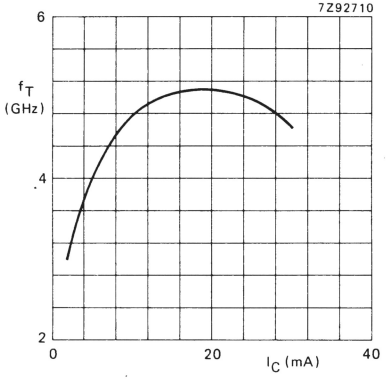


Fig. 7 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

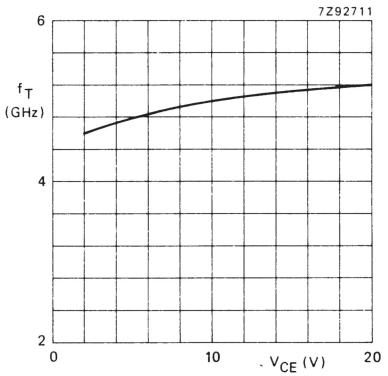


Fig. 8 I_C = 14 mA; f = 500 MHz; T_j = 25 °C; typical values.

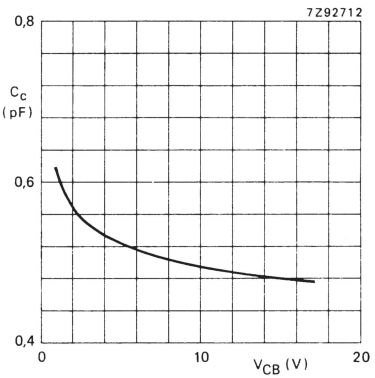


Fig. 9 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C; typical values.

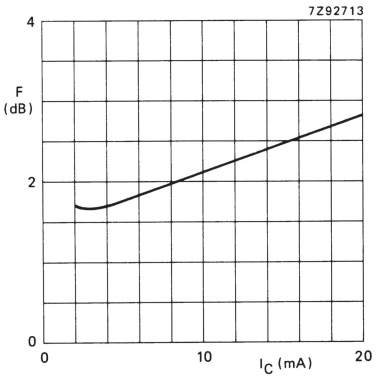


Fig. 10 V_{CE} = 10 V; f = 800 MHz; R_S = opt.; T_{amb} = 25 °C; typical values.

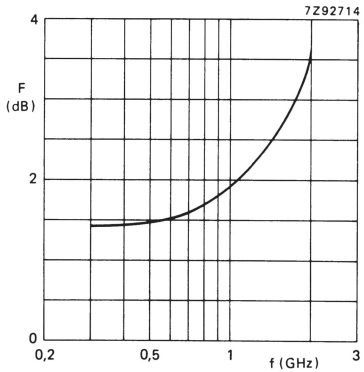


Fig. 11 V_{CE} = 10 V; I_C = 4 mA; R_S = opt.; T_{amb} = 25 °C; typical values.

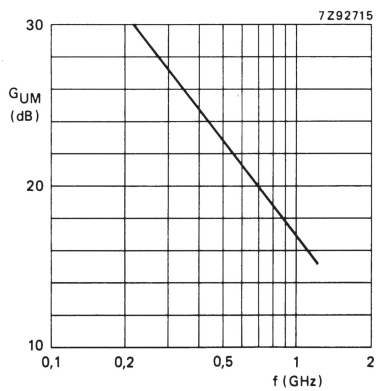


Fig. 12 V_{CE} = 10 V; I_C = 4 mA; T_{amb} = 25 °C; typical values.

N-P-N 1 GHz BROADBAND TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. The BFP91A features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

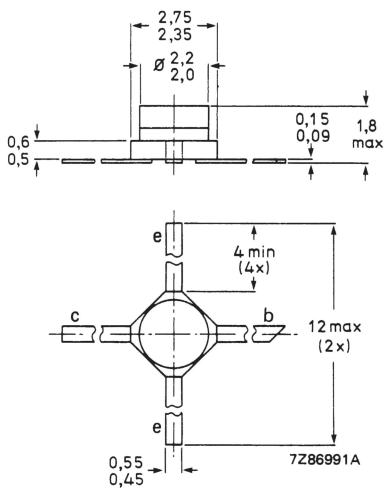
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	15 V
Collector-emitter voltage	V_{CEO}	max.	12 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0 GHz
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V; T_{amb} = 25 °C at f = 500 MHz at f = 800 MHz	G_{UM}	typ. typ.	22 dB 18 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.



Marking code: P1

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain * I_C = 30 mA; V_{CE} = 5 V	h_{FE}	min. typ.	40 90
Transition frequency at f = 500 MHz * I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6,0 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,7 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	2,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	0,5 pF
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$ at I_C = 30 mA; V_{CE} = 8 V; T_{amb} = 25 °C			
f = 500 MHz f = 800 MHz	G_{UM}	typ. typ.	22 dB 18 dB
Noise figure at f = 800 MHz; R_S = opt.; T_{amb} = 25 °C I_C = 4 mA; V_{CE} = 8 V I_C = 30 mA; V_{CE} = 8 V	F	typ. typ.	1,6 dB 2,3 dB

* Measured under pulse conditions.

s-parameters (common emitter) at V_{CE} = 8 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,92/– 13,6°	6,8/172,5°	0,011/81,7°	0,99/– 3,9°
	100	0,90/– 33,2°	6,8/160,7°	0,027/72,9°	0,97/– 9,0°
	200	0,86/– 62,0°	6,0/143,6°	0,048/59,0°	0,92/–15,6°
2	500	0,79/–117,3°	3,8/111,1°	0,075/35,5°	0,78/–26,8°
	800	0,73/–144,5°	2,6/ 93,6°	0,080/27,4°	0,73/–32,5°
	1000	0,71/–157,6°	2,1/ 85,2°	0,081/25,5°	0,72/–36,6°
	1200	0,71/–167,6°	1,8/ 77,8°	0,081/24,7°	0,72/–40,5°
	40	0,81/– 19,5°	16,0/169,4°	0,011/79,3°	0,98/– 6,9°
	100	0,79/– 46,6°	14,5/153,7°	0,024/67,7°	0,93/–15,8°
	200	0,74/– 82,4°	11,8/133,9°	0,040/52,9°	0,80/–25,4°
5	500	0,69/–136,4°	6,5/103,9°	0,056/36,1°	0,60/–35,3°
	800	0,66/–158,8°	4,3/ 89,5°	0,061/35,2°	0,55/–38,5°
	1000	0,65/–169,4°	3,5/ 82,7°	0,064/36,8°	0,54/–41,3°
	1200	0,65/–177,2°	2,9/ 76,7°	0,066/38,6°	0,53/–44,3°
	40	0,70/– 27,3°	26,2/165,5°	0,010/76,7°	0,97/–10,5°
	100	0,68/– 63,2°	22,8/146,5°	0,021/62,8°	0,86/–23,2°
	200	0,66/–102,8°	16,9/125,5°	0,032/49,2°	0,68/–34,3°
10	500	0,64/–150,7°	8,3/ 98,9°	0,043/40,6°	0,46/–41,9°
	1000	0,62/–176,9°	4,4/ 81,2°	0,056/47,4°	0,41/–45,2°
	1200	0,62/–176,9°	3,6/ 76,1°	0,061/49,9°	0,40/–47,6°
	40	0,55/– 40,8°	40,6/160,3°	0,009/73,3°	0,93/–15,8°
	100	0,57/– 86,4°	32,5/137,6°	0,017/58,1°	0,77/–32,6°
	200	0,59/–125,5°	21,6/117,0°	0,024/48,7°	0,54/–43,9°
20	500	0,62/–163,2°	9,9/ 94,4°	0,035/49,6°	0,34/–49,0°
	800	0,60/–176,3°	6,3/ 84,5°	0,046/55,5°	0,30/–49,2°
	1000	0,59/+ 175,8°	5,1/ 79,3°	0,053/58,1°	0,30/–49,9°
	1200	0,59/+ 171,1°	4,3/ 74,8°	0,061/59,7°	0,30/–52,0°
	40	0,48/– 50,4°	48,6/157,4°	0,008/71,2°	0,91/–18,7°
	100	0,53/– 99,7°	36,9/133,2°	0,015/56,5°	0,71/–37,4°
	200	0,57/–135,7°	23,3/113,3°	0,021/49,7°	0,48/–48,0°
30	500	0,60/–167,9°	10,4/ 93,1°	0,032/54,2°	0,29/–52,2°
	800	0,59/–180,0°	6,6/ 83,6°	0,044/59,9°	0,27/–52,0°
	1000	0,59/+ 173,4°	5,3/ 78,6°	0,053/61,8°	0,27/–52,2°
	1200	0,59/+ 169,2°	4,4/ 74,3°	0,060/62,8°	0,26/–54,3°

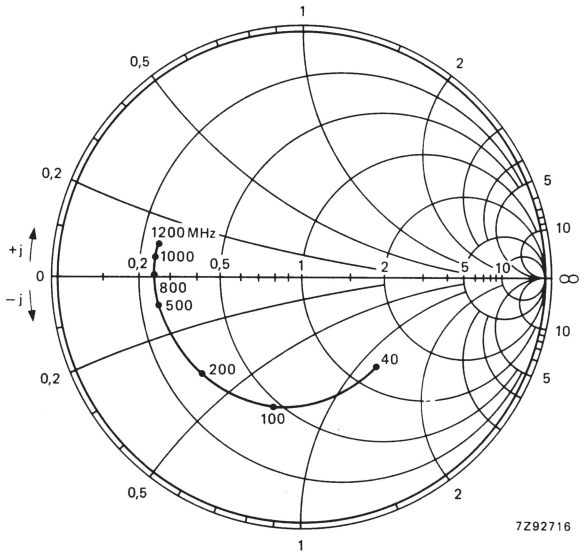


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in $\Omega \times 50$.

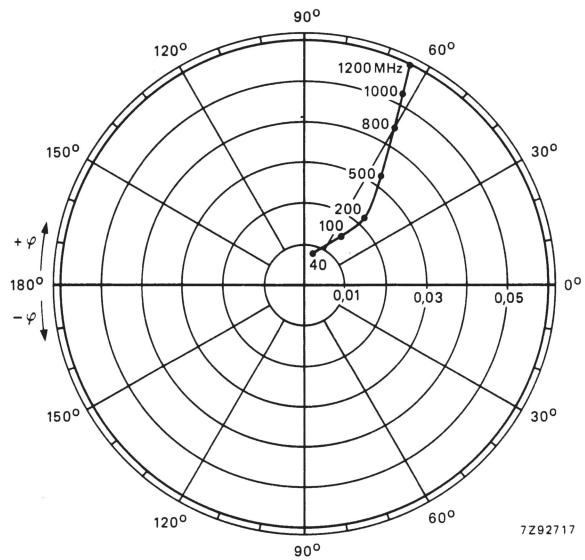


Fig. 3 Reverse transmission coefficient s_{re}.

Conditions for Figs 2 to 5: V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

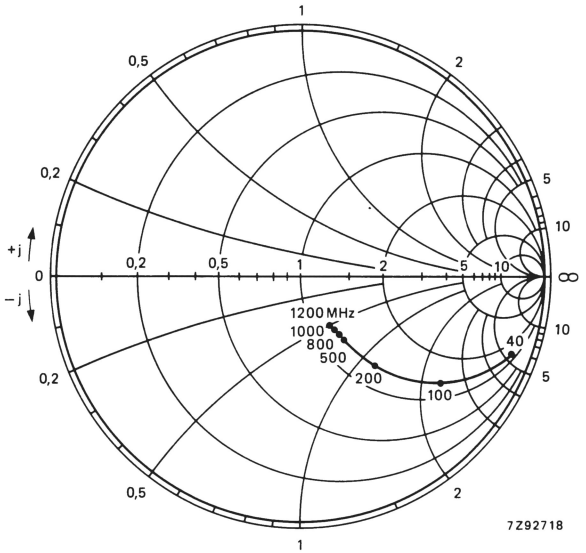


Fig. 4 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in $\Omega \times 50$.

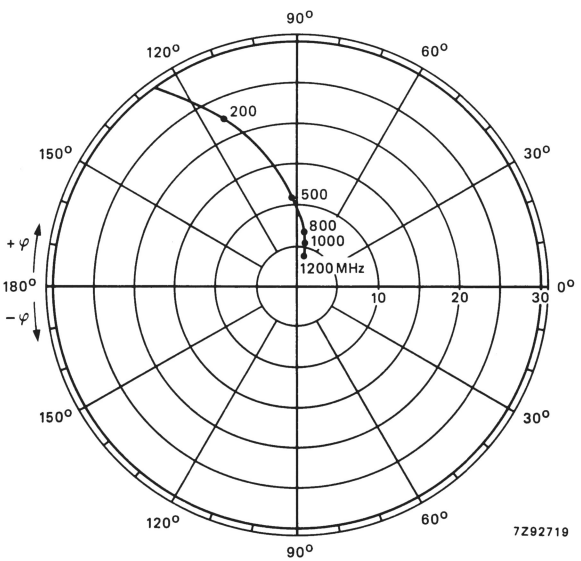


Fig. 5 Forward transmission coefficient s_{fe}.

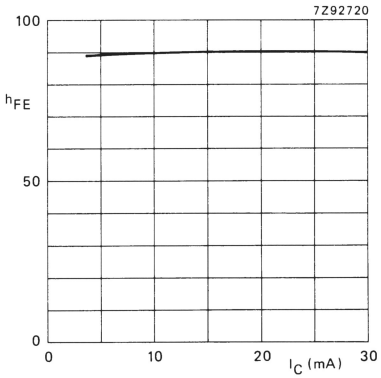


Fig. 6 V_{CE} = 5 V; T_j = 25 °C; typical values.

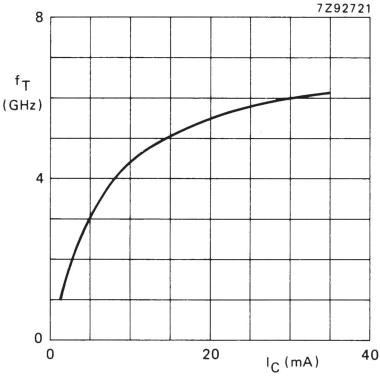


Fig. 7 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; typical values.

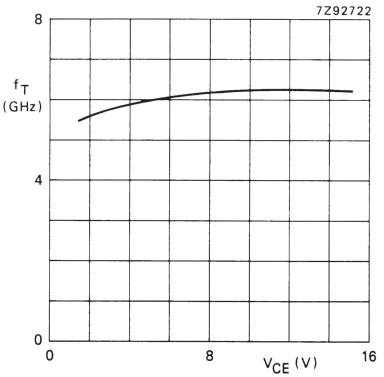


Fig. 8 I_C = 30 mA; f = 500 MHz; T_j = 25 °C; typical values.

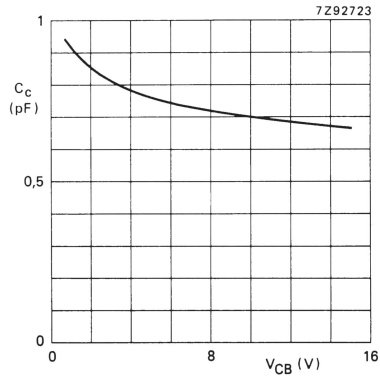


Fig. 9 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C; typical values.

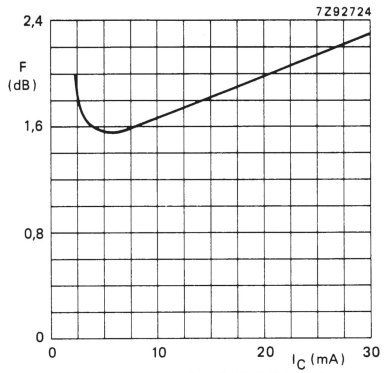


Fig. 10 V_{CE} = 8 V; f = 800 MHz; Z_S = opt.; T_{amb} = 25 °C; typical values.

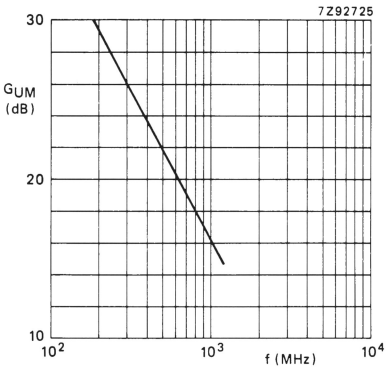


Fig. 11 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

N-P-N 1 GHz BROADBAND TRANSISTOR

Gold-metallized n-p-n transistor in a sub-miniature HERMETICALLY SEALED microstripline envelope. The BFP96 features low noise, high gain and low distortion figures.

This device is designed for v.h.f. and u.h.f. wideband amplifiers and applications in the GHz range.

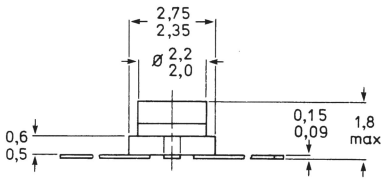
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20 V
Collector-emitter voltage	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to T_{amb} = 75 °C	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Maximum unilateral power gain I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C			
at f = 500 MHz	G_{UM}	typ.	19 dB
at f = 800 MHz		typ.	15 dB

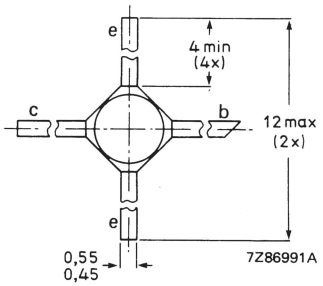
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.



Marking code: P6



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,0 V
Collector current (d.c.)	I_C	max.	100 mA
Total power dissipation up to T_{amb} = 75 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	500 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	100 nA
D.C. current gain* I_C = 50 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz* I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,3 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	5,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 0,5 V	C_{re}	typ.	1,0 pF
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{|s_{fe}|^2}{[1 - |s_{ie}|^2]\,[1 - |s_{oe}|^2]}$ at I_C = 50 mA; V_{CE} = 10 V; T_{amb} = 25 °C			
f = 500 MHz	G_{UM}	typ.	19 dB
f = 800 MHz	G_{UM}	typ.	15 dB
Noise figure at f = 800 MHz; R_S = opt.; T_{amb} = 25 °C I_C = 50 mA; V_{CE} = 10 V	F	typ.	3,7 dB

* Measured under pulse conditions.

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,83/– 36,0°	15,5/160,2°	0,022/72,1°	0,95/– 13,7°
	100	0,79/– 78,7°	12,3/136,8°	0,044/52,7°	0,80/– 27,7°
	200	0,75/–119,2°	8,1/114,6°	0,059/38,1°	0,60/– 36,1°
5	500	0,74/–159,9°	3,7/ 89,5°	0,070/29,8°	0,46/– 43,2°
	800	0,73/–174,0°	2,4/ 75,7°	0,078/33,4°	0,45/– 50,7°
	1000	0,72/ 179,0°	1,9/ 68,5°	0,083/37,4°	0,46/– 55,7°
	1200	0,72/ 173,5°	1,6/ 63,3°	0,087/40,3°	0,47/– 61,6°
	40	0,73/– 50,1°	26,3/153,9°	0,020/67,3°	0,90/– 22,1°
	100	0,72/– 99,3°	18,7/128,4°	0,036/47,4°	0,67/– 41,7°
	200	0,71/–136,2°	11,2/108,6°	0,045/37,3°	0,44/– 51,9°
10	500	0,71/–167,7°	4,8/ 88,2°	0,057/38,8°	0,29/– 58,8°
	800	0,71/–179,3°	3,1/ 75,9°	0,070/45,0°	0,29/– 63,8°
	1000	0,70/ 174,9°	2,5/ 71,1°	0,078/48,9°	0,29/– 66,8°
	1200	0,70/ 170,2°	2,1/ 65,5°	0,087/51,1°	0,30/– 71,5°
	40	0,61/– 79,4°	45,6/142,2°	0,016/59,2°	0,79/– 39,3°
	100	0,66/–128,6°	26,8/116,6°	0,025/43,9°	0,48/– 68,1°
	200	0,68/–155,2°	14,8/101,3°	0,031/43,0°	0,28/– 87,0°
30	500	0,70/–176,0°	6,1/ 86,1°	0,047/53,4°	0,17/–107,7°
	800	0,69/ 175,6°	3,9/ 76,3°	0,066/58,7°	0,16/–110,7°
	1000	0,68/ 170,5°	3,1/ 72,2°	0,079/60,9°	0,16/–109,9°
	1200	0,69/ 167,1°	2,6/ 67,2°	0,090/61,3°	0,16/–111,5°
	40	0,60/– 86,0°	49,9/139,5°	0,015/56,7°	0,75/– 44,1°
	100	0,65/–133,9°	28,1/114,3°	0,023/43,6°	0,44/– 74,8°
	200	0,67/–157,9°	15,3/100,0°	0,029/45,7°	0,26/– 96,4°
40	500	0,69/–176,7°	6,4/ 86,0°	0,047/56,1°	0,17/–120,3°
	800	0,68/ 175,3°	4,0/ 76,7°	0,067/60,7°	0,16/–123,3°
	1000	0,68/ 170,2°	3,2/ 72,6°	0,080/62,0°	0,15/–122,8°
	1200	0,68/ 167,2°	2,7/ 68,0°	0,091/62,2°	0,16/–124,1°
	40	0,58/– 91,5°	52,3/136,8°	0,015/56,4°	0,72/– 47,1°
	100	0,64/–137,0°	28,4/112,4°	0,022/44,8°	0,41/– 78,0°
	200	0,66/–159,6°	15,5/ 99,2°	0,028/47,9°	0,25/–100,3°
50	500	0,68/–176,9°	6,6/ 85,6°	0,048/57,9°	0,17/–124,8°
	800	0,68/–175,5°	4,2/ 76,1°	0,069/61,0°	0,16/–128,5°
	1000	0,68/ 170,4°	3,3/ 72,8°	0,082/62,4°	0,15/–128,1°
	1200	0,68/ 166,8°	2,8/ 66,8°	0,094/62,1°	0,16/–129,4°

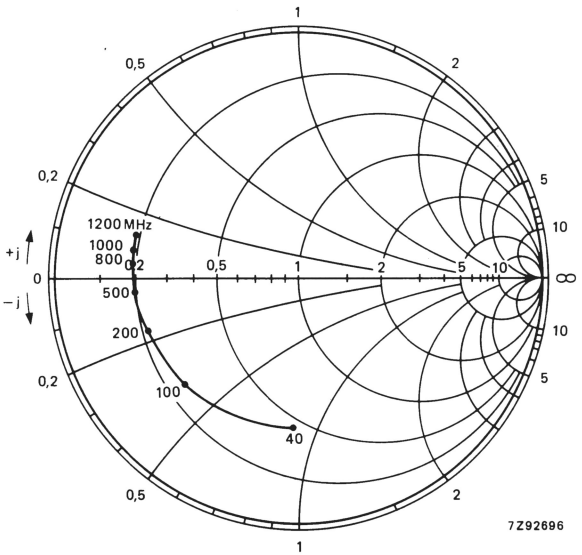


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in Ω x 50.

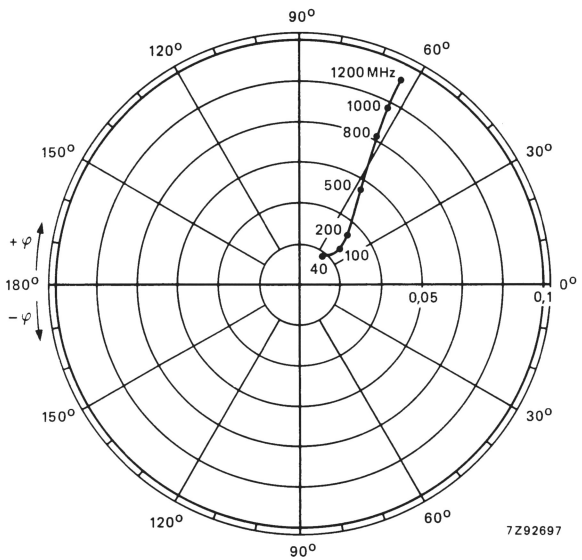


Fig. 3 Reverse transmission coefficient s_{re}.

Conditions for Figs 2 to 5: V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C.

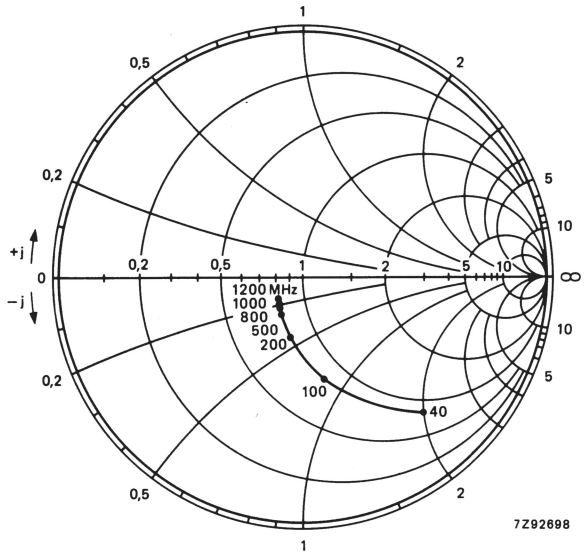


Fig. 4 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in Ω x 50.

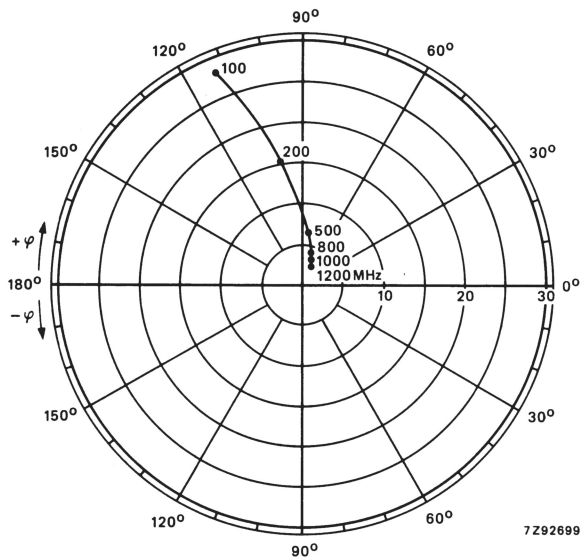


Fig. 5 Forward transmission coefficient s_{fe}.

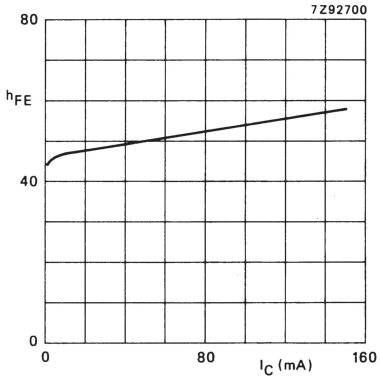


Fig. 6 V_{CE} = 10 V; T_j = 25 °C; typical values.

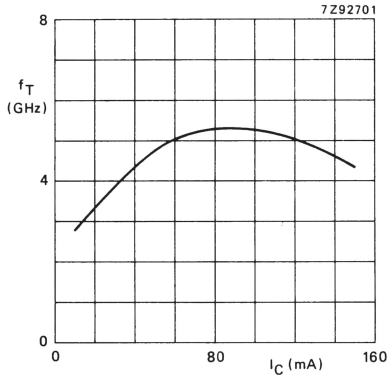


Fig. 7 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; typical values.

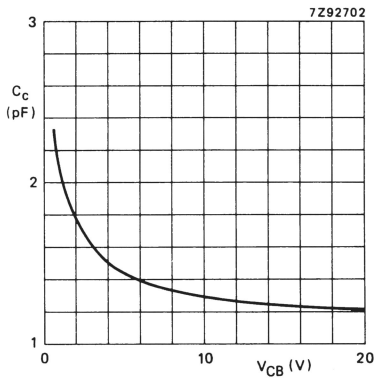


Fig. 8 $I_E = i_e$; f = 1 MHz; T_j = 25 °C; typical values.

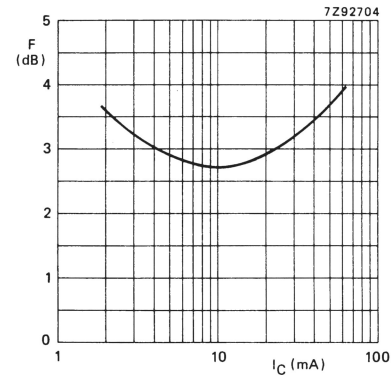


Fig. 9 V_{CE} = 10 V; f = 800 MHz; R_S = opt.; T_{amb} = 25 °C; typical values.

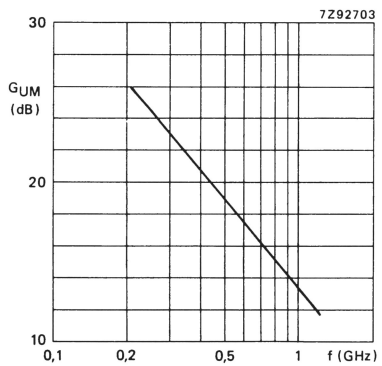


Fig. 10 V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor has extremely high power gain and good low noise performance.

P-N-P complement is BFQ24.

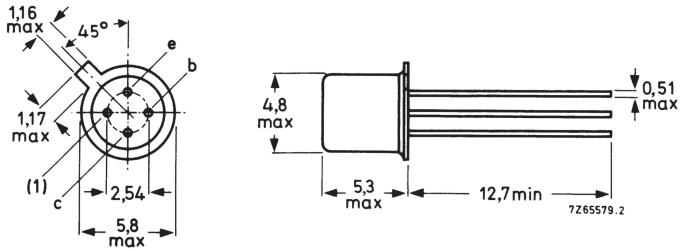
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Collector current (d.c.)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150	mW
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,65	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9	dB
Maximum unilateral power gain (see next page) I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) Shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (d.c.)	I_C	max.	35	mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}	−65 to +	200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE (note 1)

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	900	K/W
From junction to case	$R_{th\ j\text{-}c}$	=	600	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50	nA
D.C. current gain (note 2)				
I_C = 10 mA; V_{CE} = 5 V	h_{FE}	50 to	150	
Transition frequency (notes 2 and 3)				
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	5	GHz
Feedback capacitance (note 3)				
I_C = 0; V_{CE} = 5 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,65	pF
Noise figure at optimum source impedance (note 3)				
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9	dB
I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	F	<	2,5	dB
Maximum unilateral power gain (note 3)				
s_{re} assumed to be zero				
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$				
I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	>	21,0	dB
I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	16,0	dB

Notes
1. K/W is SI unit for °C/W.
2. Measured under pulse conditions.
3. Shield lead grounded.

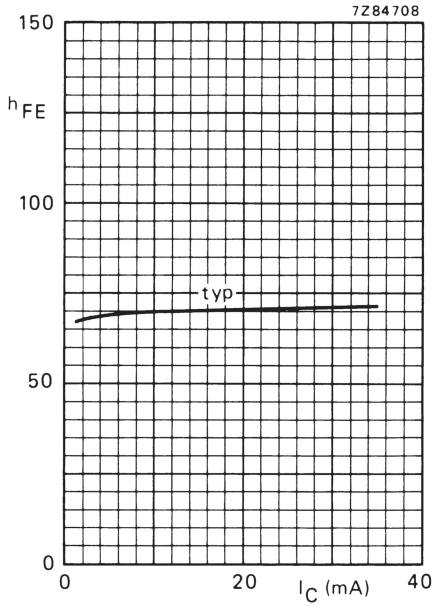


Fig. 2.

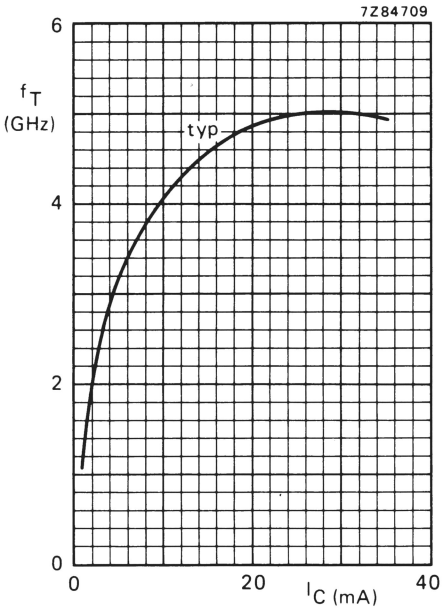


Fig. 3.

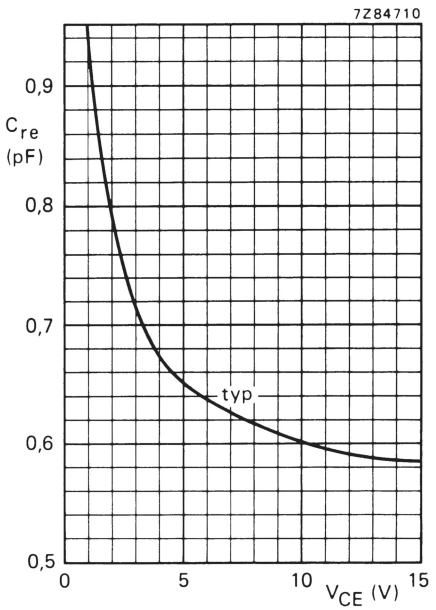


Fig. 4.

Conditions for Figs 2, 3 and 4:

Fig. 2 V_{CE} = 5 V; T_j = 25 °C.

Fig. 3 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

Fig. 4 I_C = 0; f = 1 MHz; T_{amb} = 25 °C; shield lead grounded.

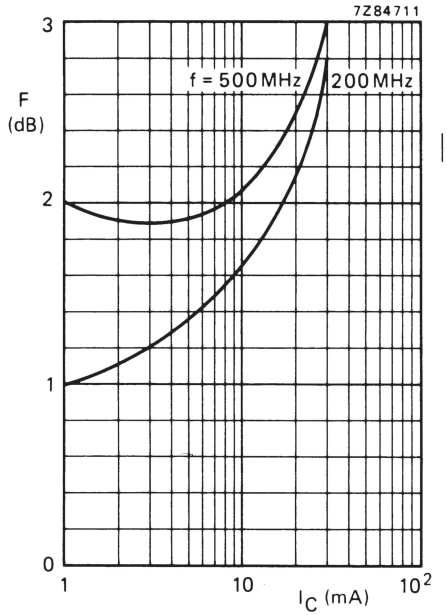


Fig. 5 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values; shield lead grounded.

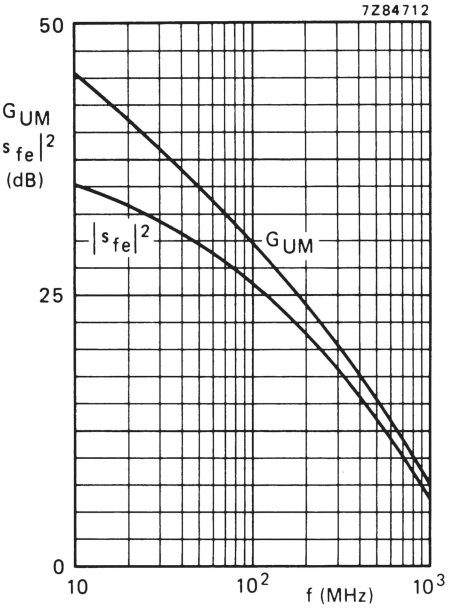


Fig. 6 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C; typical values; shield lead grounded.

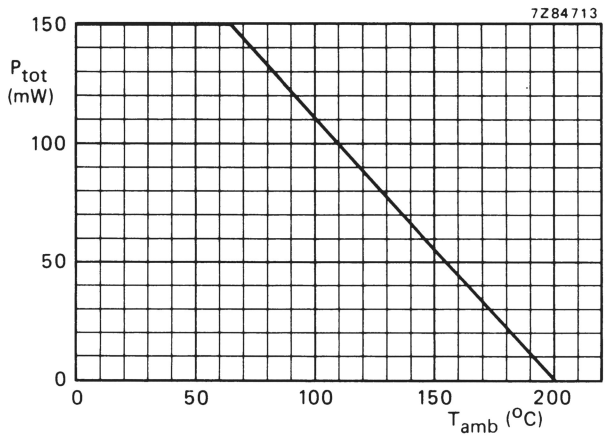


Fig. 7 Power derating curve versus ambient temperature.

SILICON WIDEBAND TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

N-P-N complements are BFR91 and BFR91A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12	V
Collector current (d.c.)	$-I_C$	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 2 mA; $-V_{CE}$ = 5 V	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz	F	typ.	2,4	dB

MECHANICAL DATA (see Fig. 1)

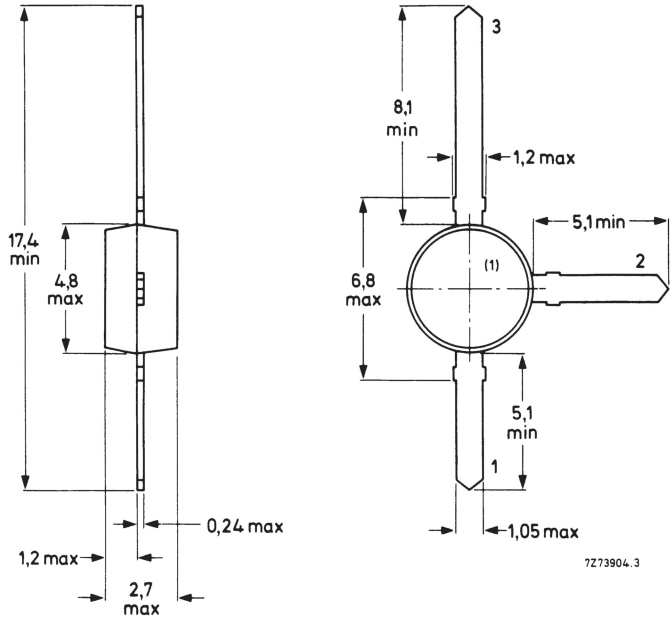
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

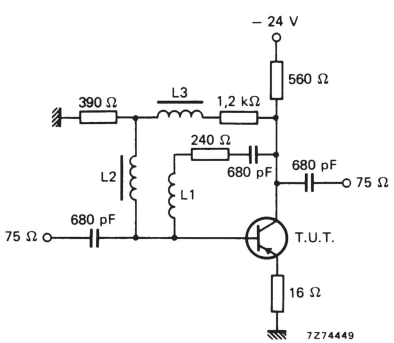
THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,5 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 5 V	$-I_{CBO}$	<	50	nA
D.C. current gain $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	h_{FE}	>	20	*
Transition frequency f = 500 MHz; $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5	GHz *
Collector capacitance f = 1 MHz; $I_E = I_e$ = 0; $-V_{CB}$ = 5 V	C_c	typ.	0,85	pF
Emitter capacitance f = 1 MHz; $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V	C_e	typ.	1,8	pF
Feedback capacitance f = 1 MHz; $-I_C$ = 2 mA; $-V_{CE}$ = 5 V	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz	F	typ.	2,4	dB
Maximum unilateral power gain s_{re} assumed to be zero $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz $10 \log \frac{\lvert s_{fe} \rvert^2}{(1-\lvert s_{ie} \rvert^2)(1-\lvert s_{oe} \rvert^2)} = G_{UM}$		typ.	16,5	dB
Intermodulation distortion* (see Fig. 2) $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; R_L = 75 Ω; VSWR < 2 $V_p = V_o$ = 300 mV at f_p = 495,25 MHz $V_q = V_o$ − 6 dB at f_q = 503,25 MHz $V_r = V_o$ − 6 dB at f_r = 505,25 MHz Measured at $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ.	−60	dB



L1: 4 turns Cu wire (0,35); winding pitch 1 mm; internal diameter 4 mm.
L2 and L3: 5 μH (code number 3122 108 20150)

Fig. 2 Intermodulation distortion test circuit.

* Measured under pulse conditions.

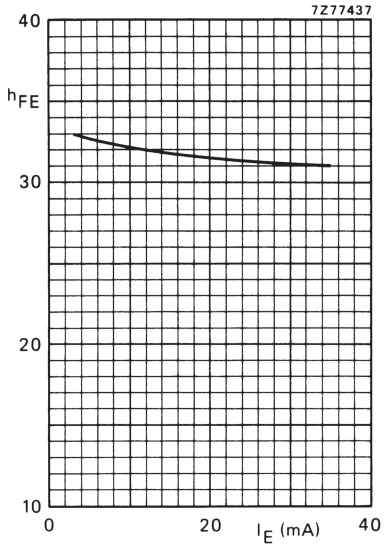


Fig. 3 Typical values; V_{CB} = 4 V.

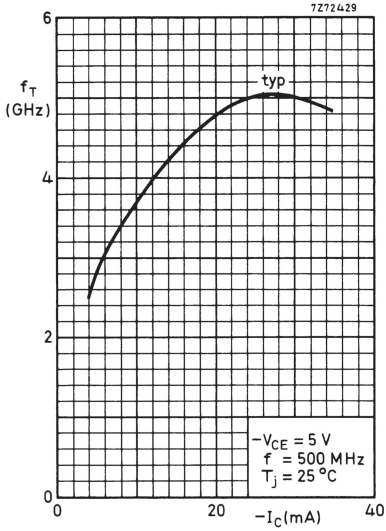


Fig. 4.

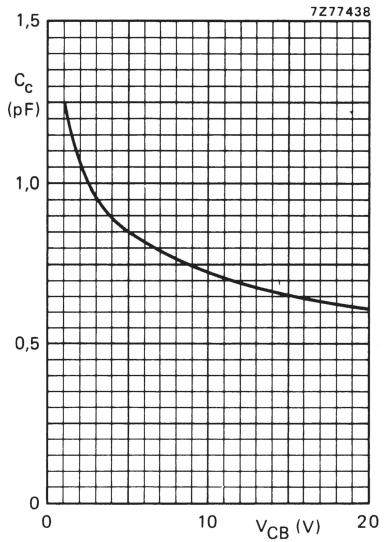


Fig. 5 Typical values; f = 1 MHz.

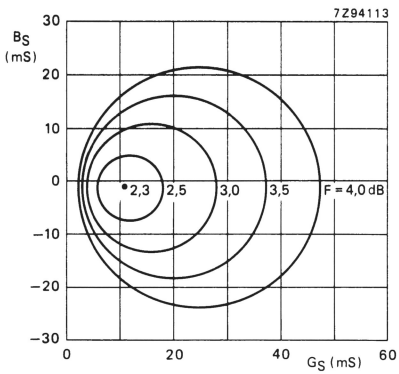


Fig. 6 Circles of constant noise figure.
V_{CE} = 8 V; I_C = 4 mA; f = 800 MHz.

s-parameters (common emitter) at V_{CE} = 5 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
5	40	0,75/ 55,8°	14,24/136,2°	0,05/ 57,18°	0,96/ 68,5°	37,8
	100	0,75/ 54,2°	14,38/139,3°	0,05/ 60,18°	0,95/ 52,9°	37,2
	200	0,75/ 56,9°	14,24/136,1°	0,05/ 60,03°	0,96/ 68,1°	37,4
	500	0,75/ 52,7°	14,13/137,7°	0,05/ 57,28°	0,96/ 64,3°	37,7
	800	0,74/ 57,7°	14,49/140,2°	0,05/ 58,93°	0,95/ 65,2°	37,0
	1000	1,01/ 178,9°	1,11/ −1,0°	1,01/−1,00°	1,06/ 178,1°	28,7
	1200	0,44/−136,3°	5,10/ 99,5°	0,11/ 51,75°	0,39/ −60,3°	15,8
	1500	0,40/ 166,2°	2,29/ 63,4°	0,18/ 51,03°	0,25/ −48,9°	8,3
	2000	0,42/ 124,6°	1,34/ 33,4°	0,29/ 35,18°	0,18/−122,3°	3,6
10	40	0,56/ 45,4°	21,73/135,9°	0,05/ 50,18°	0,90/ 62,1°	35,6
	100	0,55/ 45,4°	21,92/136,1°	0,04/ 56,25°	0,91/ 47,4°	35,8
	200	0,55/ 45,6°	22,23/138,3°	0,04/ 52,88°	0,91/ 63,0°	36,1
	500	0,55/ 42,0°	21,89/137,2°	0,05/ 55,65°	0,91/ 59,2°	35,8
	800	0,56/ 47,8°	21,63/135,9°	0,05/ 51,00°	0,90/ 59,2°	35,3
	1000	1,00/ 178,5°	1,10/ −2,7°	1,00/ 0,85°	1,06/ 176,7°	31,7
	1200	0,38/−155,8°	5,92/ 94,3°	0,09/ 60,85°	0,28/ −73,3°	16,5
	1500	0,40/ 158,6°	2,52/ 63,9°	0,18/ 58,08°	0,17/ −38,5°	8,9
	2000	0,41/ 121,0°	1,42/ 34,3°	0,30/ 37,90°	0,13/−143,2°	3,9
15	40	0,42/ 36,2°	25,83/134,5°	0,04/ 48,78°	0,87/ 58,6°	35,2
	100	0,42/ 34,7°	26,23/134,7°	0,04/ 49,08°	0,86/ 44,0°	35,0
	200	0,42/ 36,1°	25,70/134,9°	0,04/ 52,05°	0,86/ 60,2°	34,8
	500	0,42/ 31,1°	26,10/136,2°	0,04/ 50,10°	0,87/ 55,2°	35,2
	800	0,42/ 37,6°	26,06/136,1°	0,04/ 52,15°	0,86/ 56,3°	35,1
	1000	1,00/−176,4°	1,15/ −2,7°	1,04/−0,40°	1,11/−179,7°	33,6
	1200	0,37/−165,8°	6,20/ 92,3°	0,09/ 65,95°	0,23/ −81,1°	16,7
	1500	0,41/ 155,7°	2,61/ 63,7°	0,19/ 60,73°	0,15/ 38,5°	9,2
	2000	0,40/ 115,4°	1,37/ 19,2°	0,30/ 51,63°	0,11/−162,2°	3,5
20	40	0,33/ 26,1°	28,68/135,2°	0,04/ 49,10°	0,83/ 56,6°	34,6
	100	0,33/ 24,3°	28,86/134,8°	0,04/ 52,38°	0,83/ 41,4°	34,7
	200	0,33/ 26,4°	28,38/134,7°	0,04/ 49,58°	0,83/ 56,9°	34,6
	500	0,32/ 22,2°	28,68/134,4°	0,04/ 47,18°	0,83/ 53,3°	34,8
	800	0,33/ 27,1°	28,58/135,5°	0,04/ 53,03°	0,83/ 53,6°	34,8
	1000	1,01/ 178,2°	1,11/ 1,4°	1,00/ 0,60°	1,11/ 178,8°	23,4
	1200	0,37/−171,6°	6,28/ 91,2°	0,08/ 69,08°	0,21/ −86,5°	16,8
	1500	0,41/ 152,7°	2,66/ 63,3°	0,19/ 62,48°	0,13/ 132,1°	9,4
	2000	0,40/ 109,9°	1,36/ 19,5°	0,31/ 30,85°	0,11/−171,6°	3,5
30	40	0,23/ 4,5°	30,84/133,1°	0,04/ 47,65°	0,77/ 54,7°	34,0
	100	0,22/ 2,4°	31,17/137,4°	0,04/ 48,13°	0,78/ 38,9°	34,1
	200	0,23/ 2,8°	30,93/136,6°	0,04/ 47,20°	0,77/ 54,7°	34,0
	500	0,23/ −1,7°	31,02/134,6°	0,04/ 44,65°	0,78/ 50,3°	34,1
	800	0,23/ 4,9°	30,97/133,5°	0,04/ 48,15°	0,77/ 51,4°	33,9
	1000	0,99/ 178,5°	1,18/ −1,8°	0,99/ 2,05°	1,15/ 177,5°	24,9
	1200	0,37/−178,2°	6,34/ 90,1°	0,08/ 72,60°	0,19/ −92,7°	16,9
	1500	0,42/ 151,4°	2,64/ 62,7°	0,19/ 64,38°	0,13/−172,2°	9,4
	2000	0,41/ 109,0°	1,36/ 19,3°	0,31/ 30,45°	0,12/−178,5°	3,6

SILICON PLANAR EPITAXIAL TRANSISTOR

Gold-metallized p-n-p transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features low intermodulation distortion and high power gain due to its very high transition frequency, excellent wideband properties and low noise up to high frequencies.

N-P-N complement is BFP91A.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	20 V
Collector-emitter voltage	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	h_{FE}	min.	20
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5 GHz
Maximum unlisted power gain $-I_C$ = 30 mA; $-V_{CE}$ = 8 V; T_{amb} = 25 °C			
at f = 500 MHz	G_{UM}	typ.	19 dB
at f = 800 MHz		typ.	15 dB

MECHANICAL DATA

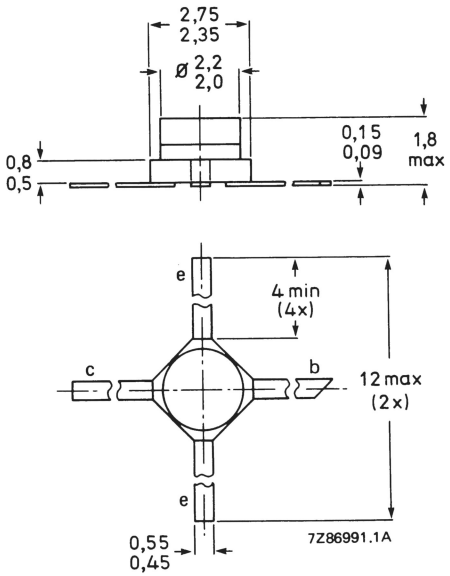
SOT-173 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.

Marking code: C3



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$	200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $-V_{CB} = 5$ V	$-I_{CBO}$	max.	50 nA
D.C. current gain			
$-I_C = 30$ mA; $-V_{CE} = 5$ V	h_{FE}	min.	20
Transition frequency at f = 500 MHz			
$-I_C = 30$ mA; $-V_{CE} = 5$ V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	1 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ.	1,8 pF
Feedback capacitance at f = 1 MHz			
$I_C = 0$; $-V_{CE} = 10$ V;	C_{re}	typ.	0,8 pF
Maximum unilateral power gain (s_{re} assumed to be zero)			
G_{UM} (dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{[1-\lvert s_{ie} \rvert^2][1-\lvert s_{oe} \rvert^2]}$			
at $-I_C = 30$ mA; $-V_{CE} = 8$ V;			
f = 500 MHz	G_{UM}	typ.	19 dB
f = 800 MHz		typ.	15 dB
Noise figures at f = 800 MHz; R_S = opt.;			
$-I_C = 4$ mA; $V_{CE} = 8$ V	F	typ.	2,3 dB
$-I_C = 30$ mA; $V_{CE} = 8$ V		typ.	3,7 dB

s-parameters (common emitter) at V_{CE} = 8 V; T_{amb} = 25 °C

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,84/ −13,4°	6,6/172,9°	0,019/ 32,8°	0,99/ −5,7°
	100	0,83/ −32,3°	6,4/161,1°	0,047/ 73,3°	0,95/ −14,1°
	200	0,80/ −60,8°	5,7/143,8°	0,083/ 59,4°	0,87/ −25,7°
2	500	0,74/−114,6°	3,7/112,1°	0,136/ 35,8°	0,66/ −45,8°
	800	0,71/−142,7°	2,6/ 92,5°	0,149/ 25,7°	0,55/ −54,2°
	1000	0,68/−154,3°	2,1/ 83,3°	0,153/ 23,1°	0,52/ −58,0°
	1200	0,67/−164,3°	1,7/ 75,5°	0,153/ 20,8°	0,50/ −62,2°
	40	0,66/ −22,5°	13,5/169,4°	0,017/ 79,7°	0,97/ −10,2°
	100	0,66/ −52,0°	12,4/153,7°	0,039/ 67,5°	0,90/ −24,2°
	200	0,66/ −89,6°	10,1/132,9°	0,064/ 52,4°	0,74/ −41,3°
5	500	0,68/−141,5°	5,5/103,0°	0,091/ 34,5°	0,46/ −64,5°
	800	0,67/−162,7°	3,7/ 87,8°	0,100/ 31,9°	0,36/ −72,6°
	1000	0,66/−172,1°	3,0/ 80,6°	0,106/ 32,6°	0,34/ −75,4°
	1200	0,67/−179,7°	2,5/ 73,8°	0,111/ 33,0°	0,32/ −79,4°
	40	0,47/ −35,4°	20,4/165,5°	0,014/ 76,9°	0,93/ −14,9°
	100	0,52/ −76,4°	17,7/146,4°	0,032/ 62,8°	0,82/ −33,9°
	200	0,59/−115,9°	13,1/124,3°	0,048/ 49,2°	0,62/ −54,7°
10	500	0,65/−157,4°	6,4/ 97,9°	0,066/ 40,4°	0,35/ −80,0°
	800	0,65/−173,4°	4,2/ 84,7°	0,078/ 43,3°	0,27/ −89,0°
	1000	0,65/ 178,9°	3,4/ 78,8°	0,087/ 45,7°	0,24/ −91,3°
	1200	0,65/ 172,9°	2,9/ 72,9°	0,096/ 47,0°	0,23/ −94,9°
	40	0,29/ −63,8°	26,8/162,1°	0,012/ 74,1°	0,89/ −19,5°
	100	0,45/−108,1°	22,0/140,1°	0,025/ 59,7°	0,74/ −43,0°
	200	0,58/−139,5°	15,1/118,3°	0,036/ 49,0°	0,52/ −66,6°
20	500	0,65/−168,7°	7,0/ 94,6°	0,051/ 47,8°	0,29/ −95,4°
	800	0,66/−179,3°	4,5/ 82,9°	0,066/ 52,3°	0,22/−106,4°
	1000	0,66/ 173,0°	3,7/ 77,4°	0,077/ 54,7°	0,20/−109,3°
	1200	0,66/ 168,2°	3,1/ 72,0°	0,088/ 55,3°	0,19/−112,9°
	40	0,23/ −93,3°	29,3/160,2°	0,010/ 72,3°	0,86/ −21,6°
	100	0,45/−125,5°	23,5/137,3°	0,021/ 59,0°	0,70/ −47,1°
	200	0,58/−149,5°	15,5/115,7°	0,030/ 50,6°	0,48/ −71,6°
30	500	0,66/−173,2°	7,1/ 93,2°	0,046/ 52,8°	0,26/−101,2°
	800	0,66/ 176,4°	4,6/ 81,9°	0,062/ 57,4°	0,21/−112,3°
	1000	0,66/ 170,5°	3,7/ 76,5°	0,074/ 59,1°	0,19/−115,4°
	1200	0,66/ 165,8°	3,1/ 71,1°	0,085/ 59,5°	0,18/−118,5°

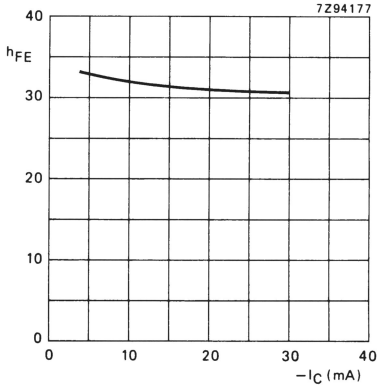


Fig. 2 $-V_{CE}$ = 5 V; T_j = 25 °C.

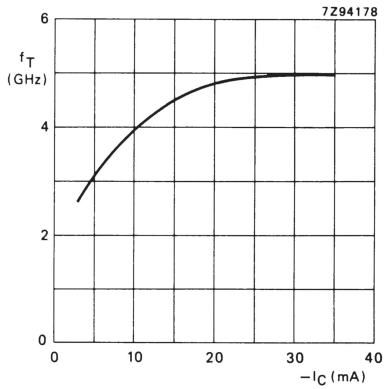


Fig. 3 $-V_{CE}$ = 5 V; f = 500 MHz; T_j = 25 °C.

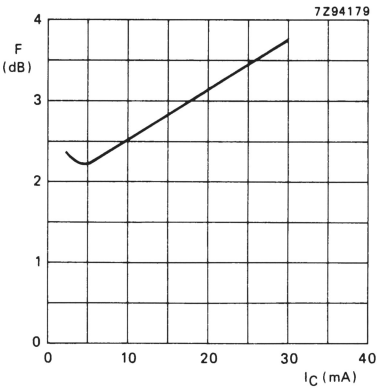


Fig. 4 $-V_{CE}$ = 8 V; f = 800 MHz; T_{amb} = 25 °C; Z_s = optimum.

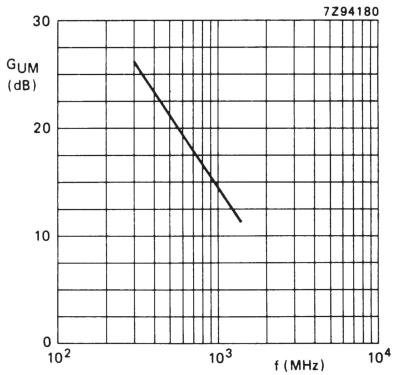


Fig. 5 $-V_{CE}$ = 8 V; $-I_C$ = 30 mA; T_{amb} = 25 °C.

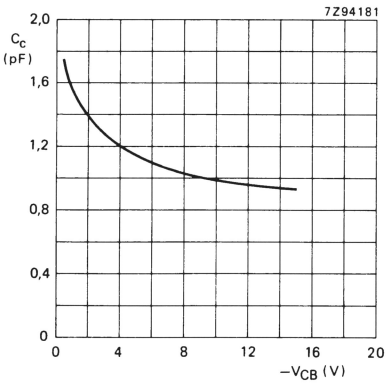


Fig. 6 $-I_E = -I_e$ = 0; f = 1 MHz; T_j = 25 °C.

$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C

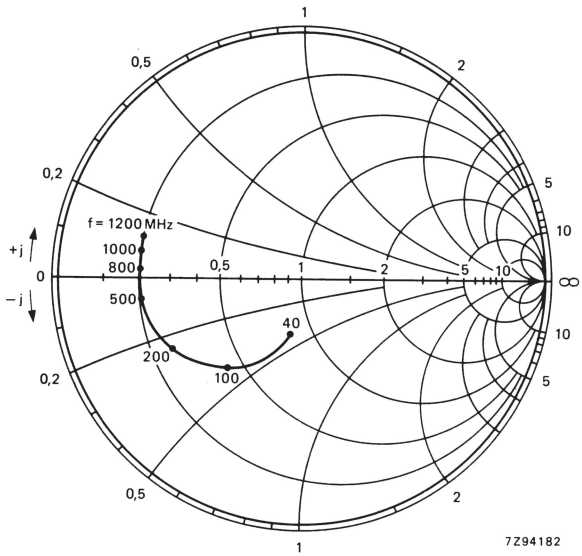


Fig. 7.

Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C

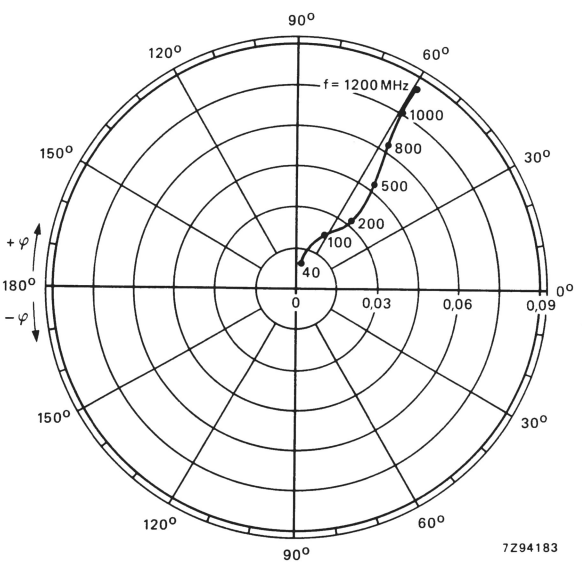


Fig. 8.

Reverse transmission coefficient s_{re}.

$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C

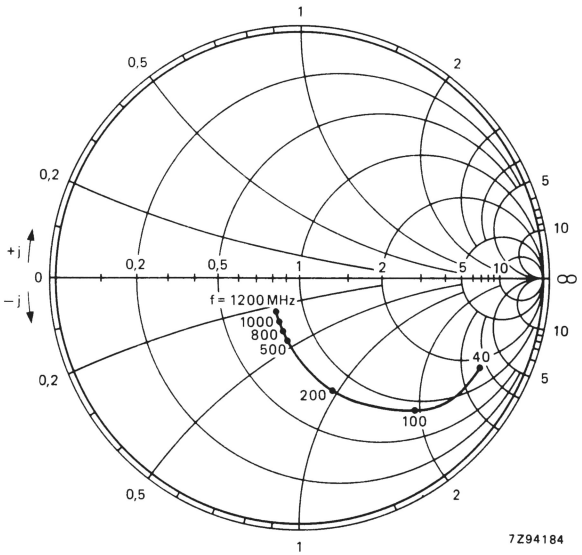


Fig. 9.

Output impedance derived from output reflection coefficient s_{oe} co-ordinates on ohm x 50.

$-V_{CE}$ = 8 V
$-I_C$ = 30 mA
T_{amb} = 25 °C

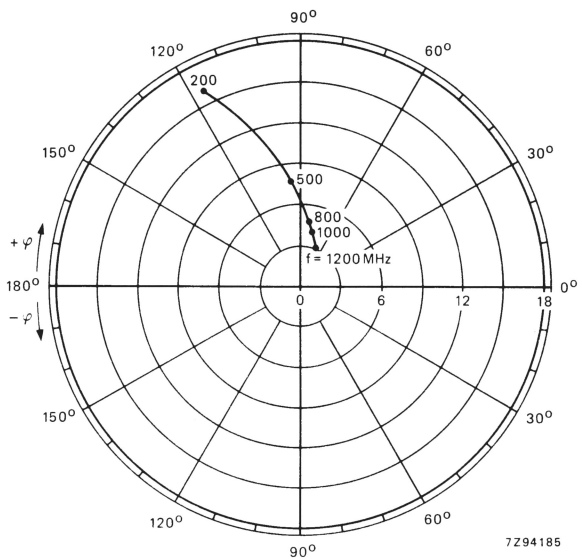


Fig. 10.

Forward transmission coefficient s_{fe}.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFQ22S.

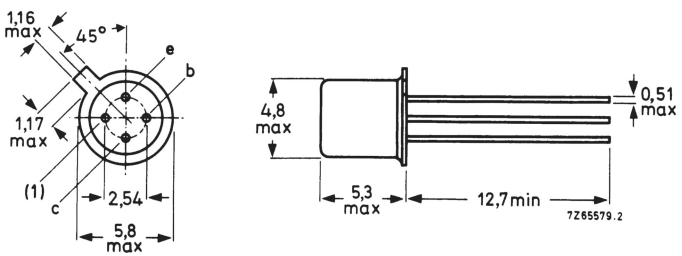
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12 V
Collector current (d.c.)	$-I_C$	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,8 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Maximum unilateral power gain (see next page) $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	15	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	12	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2	V
Collector current (d.c.)	$-I_C$	max.	35	mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	50	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9	K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6	K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 5 V	$-I_{CBO}$	<	50	nA
D.C. current gain (note 1) $-I_C$ = 30 mA; $-V_{CE}$ = 5 V	h_{FE}	> typ.	20 50	
Transition frequency (notes 1 and 2) $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz	f_T	typ.	5	GHz
Collector capacitance (note 3) $I_E = I_e$ = 0; $-V_{CB}$ = 5 V; f = 1 MHz	C_c	typ.	1,2	pF
Emitter capacitance $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V; f = 1 MHz	C_e	typ.	2,5	pF
Feedback capacitance (note 2) I_C = 0; $-V_{CE}$ = 5 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance (note 2) $-I_C$ = 2 mA; $-V_{CE}$ = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4	dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ $-I_C$ = 30 mA; $-V_{CE}$ = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,0	dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

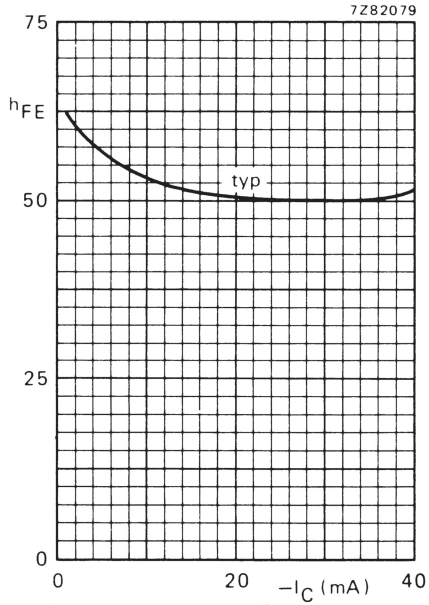


Fig. 2 $-V_{CE}$ = 5 V; T_j = 25 °C.

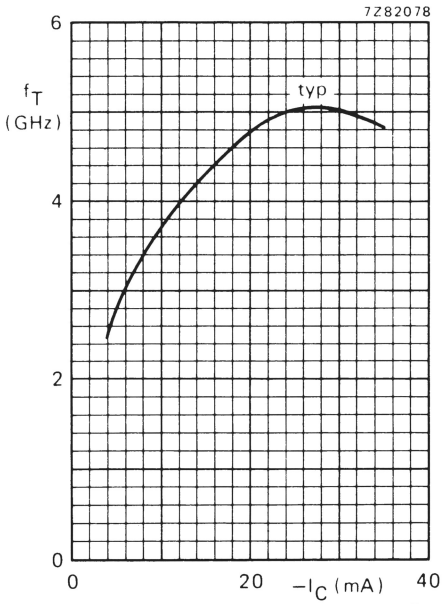


Fig. 3 $-V_{CE}$ = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

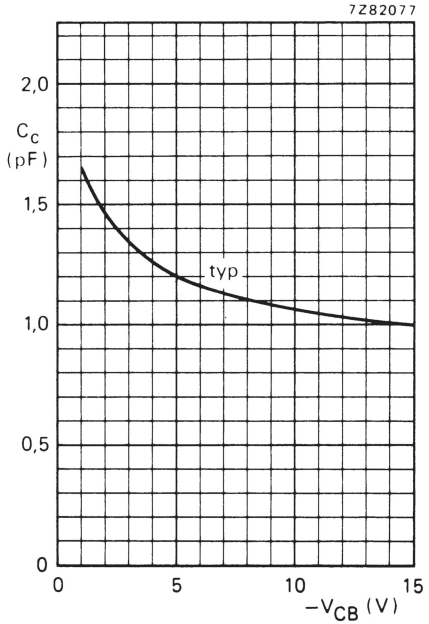


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package.

It is intended for use in u.h.f. applications such as broadband aerial amplifiers (30 MHz to 860 MHz) and in microwave amplifiers such as radar systems, spectrum analysers etc.

The BFQ32 offers a high transition frequency and a low intermodulation distortion figure over a wide current range.

QUICK REFERENCE DATA

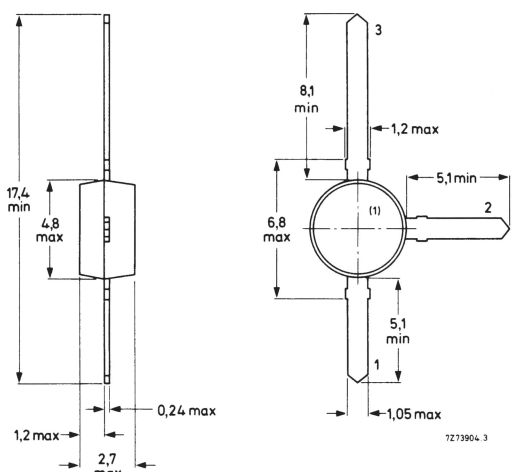
Collector-base voltage (open emitter)	$-V_{CBO}$	max	20	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max	15	V
Collector current (d.c.)	$-I_C$	max	75	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max	500	mW
Junction temperature	T_j	max	175	°C
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	>	3,6	GHz
Feedback capacitance at f = 1 MHz $-I_C$ = 10 mA; $-V_{CE}$ = 10 V	C_{re}	<	1,4	pF
Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ	3,75	dB
Intermodulation distortion at T_{amb} = 25 °C $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω; V_o = 500 mV $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ	−60	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections
1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max	3 V
Collector current (d.c.)	$-I_C$	max	75 mA
Collector current (peak value); $f > 1$ MHz	$-I_{CM}$	max	150 mA
Total power dissipation up to $T_{amb} = 60$ °C mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	P_{tot}		500 mW
Storage temperature	T_{stg}		−65 to + 175 °C
Junction temperature	T_j	max	175 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,23 °C/mW

CHARACTERISTICS

$T_{amb} = 25$ °C unless otherwise specified

Collector cut-off current $I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	<	100 nA
D.C. current gain * $-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	>	20
$-I_C = 75$ mA; $-V_{CE} = 10$ V	h_{FE}	>	20
Transition frequency at f = 500 MHz * $-I_C = 50$ mA; $-V_{CE} = 10$ V	f_T	>	3,6 GHz
		typ	4,2 GHz
$-I_C = 75$ mA; $-V_{CE} = 10$ V	f_T	>	4,0 GHz
		typ	4,6 GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $-V_{CB} = 10$ V	C_c	typ	1,3 pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ	6 pF
Feedback capacitance at f = 1 MHz $-I_C = 10$ mA; $-V_{CE} = 10$ V	C_{re}	<	1,4 pF
		typ	1,25 pF

* Measured under pulse conditions.

Noise figure at optimum source impedance $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz	F	typ	3,75 dB
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1-\lvert s_{ie} \rvert^2)(1-\lvert s_{oe} \rvert^2)}$ $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; f = 500 MHz	G_{UM}	typ	14 dB
Intermodulation distortion (see fig. 1) $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; R_L = 75 Ω $V_p = V_o$ = 500 mV at f_p = 495,25 MHz $V_q = V_o$ −6 dB at f_q = 503,25 MHz $V_r = V_o$ −6 dB at f_r = 505,25 MHz Measured at $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ	−60 dB

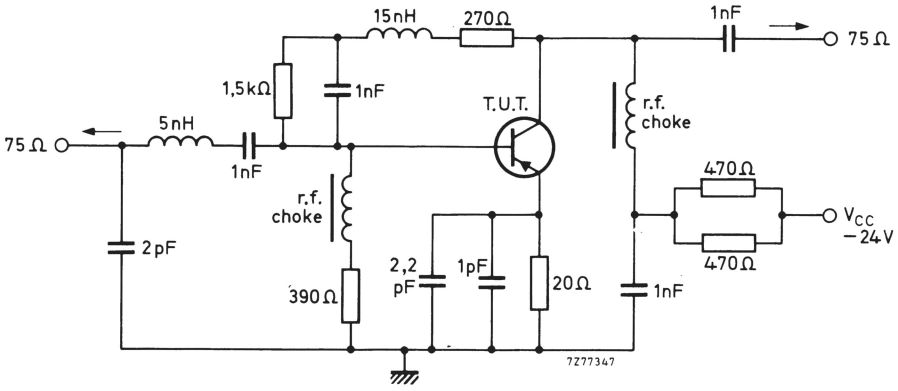
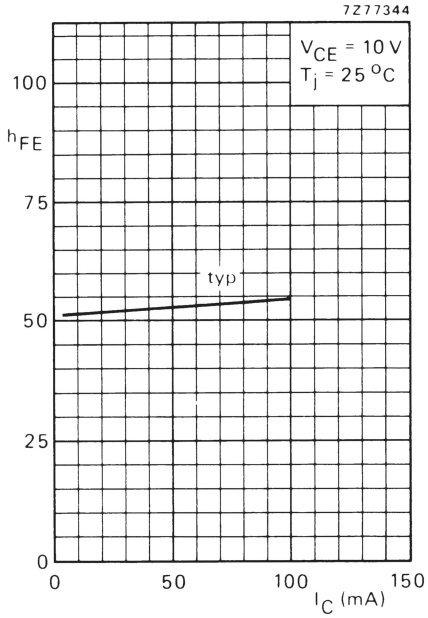
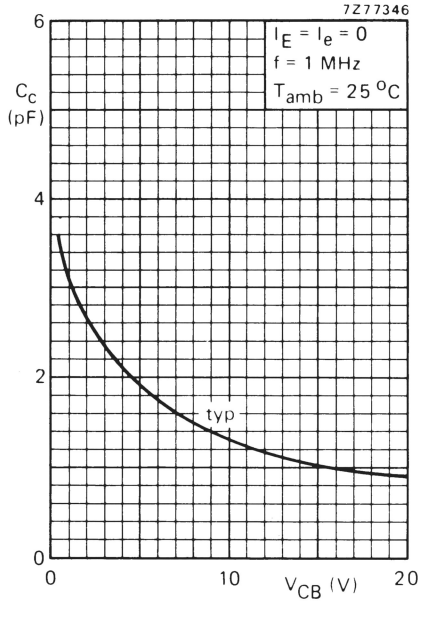
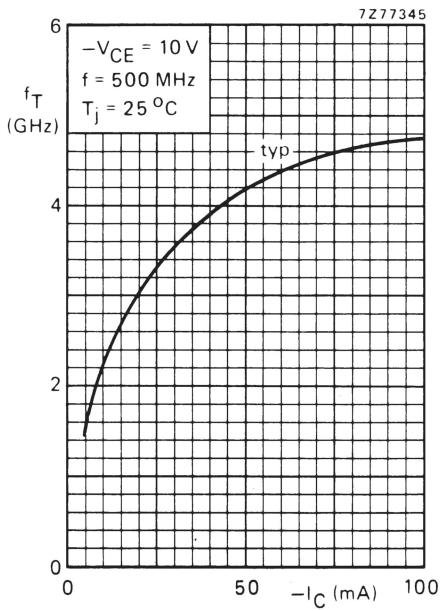


Fig. 1 Intermodulation test circuit.


7Z77344
V_{CE} = 10 V
T_j = 25 °C
h_{FE}
100
75
50
25
0
typ
0
50
100
150
I_C (mA)


7Z77346
$I_E = I_e = 0$
f = 1 MHz
T_{amb} = 25 °C
C_c (pF)
6
4
2
0
typ
0
10
20
V_{CB} (V)


7Z77345
$-V_{CE}$ = 10 V
f = 500 MHz
T_j = 25 °C
f_T (GHz)
6
4
2
0
typ
0
50
100
$-I_C$ (mA)

SILICON PLANAR EPITAXIAL TRANSISTOR

Gold-metallized p-n-p transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. It is intended for use in u.h.f. applications such as broadband aerial amplifiers. Microwave applications include radar systems, spectrum analysers etc.

The BFQ32C features a high transition frequency and a low intermodulation distortion figure over a wide current range.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	20 V
Collector-emitter voltage	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	100 mA
Total power dissipation up to T_{amb} = 75 °C	P_{tot}	max.	500 mW
Junction temperature	T_j	max.	175 °C
D.C. current gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	h_{FE}	min.	20
Transition frequency at f = 500 MHz $-I_C$ = 50 mA; $-V_{CE}$ = 10 V	f_T	typ.	4,5 GHz
Maximum unlisted power gain $-I_C$ = 50 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C			
at f = 500 MHz	G_{UM}	typ.	17 dB
at f = 800 MHz		typ.	13 dB

MECHANICAL DATA

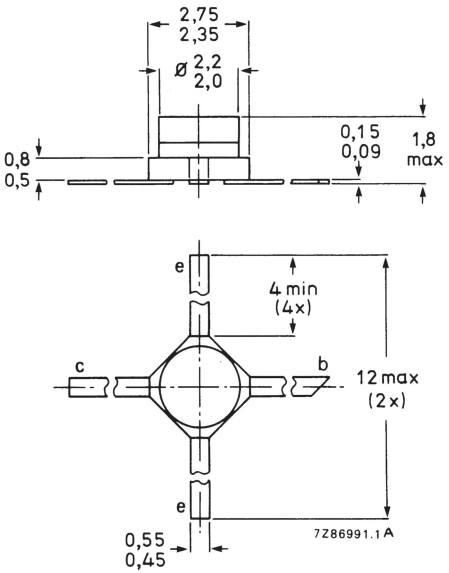
SOT-173 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.

Marking code: C2



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3 V
Collector current (d.c.)	$-I_C$	max.	100 mA
Total power dissipation up to T_{amb} = 75 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	500 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$	200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	100 nA
D.C. current gain			
$-I_C = 50$ mA; $-V_{CE} = 10$ V	h_{FE}	min.	20
Transition frequency at f = 500 MHz			
$-I_C = 50$ mA; $-V_{CE} = 10$ V	f_T	typ.	4,5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	1,9 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ.	5 pF
Feedback capacitance at f = 1 MHz			
$I_C = 0$; $-V_{CE} = 10$ V;	C_{re}	typ.	1,4 pF
Maximum unilateral power gain (s_{re} assumed to be zero)			
$G_{UM}\,(\text{dB}) = 10 \log \dfrac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$			
at $-I_C = 50$ mA; $-V_{CE} = 10$ V			
f = 500 MHz	G_{UM}	typ.	17 dB
f = 800 MHz		typ.	13 dB
Noise figures at f = 800 MHz; R_S = opt.;			
$-I_C = 50$ mA; $V_{CE} = 10$ V	F	typ.	4,3 dB

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,64/ −46,7°	13,4/158,5°	0,028/ 70,2°	0,93/ −17,5°
	100	0,69/ −94,4°	10,4/134,2°	0,055/ 49,2°	0,75/ −35,6°
	200	0,74/−132,7°	6,7/111,3°	0,070/ 32,7°	0,54/ −48,3°
5	500	0,77/−166,4°	3,0/ 85,7°	0,080/ 23,3°	0,38/ −60,4°
	800	0,77/−178,6°	1,9/ 71,5°	0,084/ 25,5°	0,38/ −69,9°
	1000	0,76/ 175,2°	1,6/ 64,7°	0,087/ 28,8°	0,39/ −76,7°
	1200	0,77/ 170,2°	1,3/ 57,9°	0,070/ 31,7°	0,41/ −84,4°
	40	0,49/ −69,3°	20,4/153,8°	0,023/ 66,3°	0,88/ −26,1°
	100	0,64/−117,9°	14,7/127,8°	0,042/ 45,4°	0,65/ −51,6°
	200	0,72/−148,5°	8,8/107,1°	0,051/ 33,3°	0,41/ −70,4°
10	500	0,76/−173,5°	3,8/ 85,3°	0,061/ 32,9°	0,26/ −88,9°
	800	0,76/ 176,5°	2,4/ 73,4°	0,071/ 38,7°	0,25/ −96,4°
	1000	0,76/ 171,4°	2,0/ 66,9°	0,079/ 42,5°	0,26/−100,5°
	1200	0,76/ 167,0°	1,7/ 60,7°	0,087/ 45,0°	0,27/−105,9°
	40	0,42/−120,4°	32,2/145,8°	0,016/ 61,2°	0,79/ −42,2°
	100	0,65/−148,4°	20,1/119,5°	0,025/ 44,4°	0,53/ −80,2°
	200	0,73/−165,5°	11,3/102,0°	0,031/ 41,5°	0,36/−111,0°
30	500	0,76/ 179,3°	4,7/ 84,6°	0,046/ 51,1°	0,27/−141,8°
	800	0,76/ 172,1°	3,0/ 74,7°	0,064/ 56,4°	0,26/−150,4°
	1000	0,76/ 167,5°	2,4/ 69,5°	0,077/ 58,5°	0,25/−153,6°
	1200	0,76/ 163,8°	2,0/ 64,5°	0,088/ 59,0°	0,25/−156,1°
	40	0,44/−131,3°	35,0/143,6°	0,014/ 60,0°	0,76/ −46,6°
	100	0,66/−153,8°	21,1/117,8°	0,022/ 44,9°	0,51/ −87,2°
	200	0,74/−168,5°	11,6/101,0°	0,028/ 44,6°	0,36/−119,3°
40	500	0,76/ 178,3°	4,9/ 84,4°	0,044/ 55,2°	0,29/−149,2°
	800	0,76/ 171,3°	3,1/ 74,8°	0,063/ 59,5°	0,27/−157,8°
	1000	0,76/ 167,0°	2,5/ 70,0°	0,076/ 60,9°	0,26/−161,4°
	1200	0,77/ 163,5°	2,1/ 64,9°	0,088/ 61,1°	0,26/−163,8°
	40	0,46/−137,3°	36,6/141,9°	0,013/ 58,9°	0,73/ −50,0°
	100	0,68/−157,1°	21,5/116,3°	0,020/ 45,6°	0,49/ −92,1°
	200	0,74/−170,4°	11,8/100,1°	0,026/ 46,9°	0,36/−124,6°
50	500	0,76/−177,5°	4,9/ 84,0°	0,043/ 57,7°	0,30/−153,4°
	800	0,76/ 171,0°	3,1/ 74,9°	0,063/ 61,4°	0,28/−161,8°
	1000	0,76/ 166,6°	2,5/ 69,8°	0,076/ 62,5°	0,27/−165,5°
	1200	0,76/ 162,9°	2,1/ 64,9°	0,089/ 62,4°	0,27/−168,1°

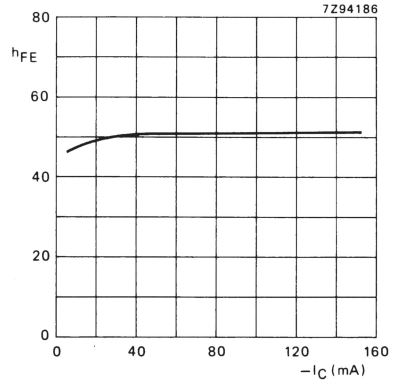


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C.

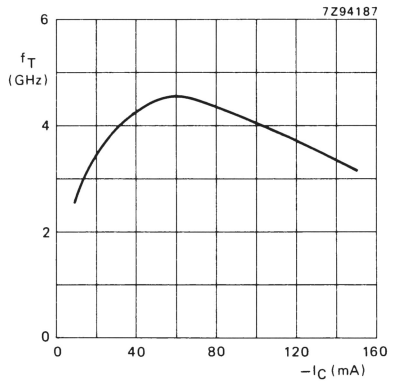


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C.

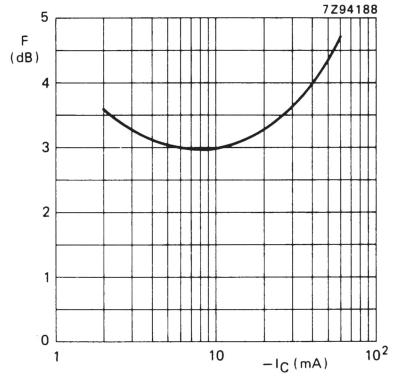


Fig. 4 $-V_{CE}$ = 10 V; f = 800 MHz; T_{amb} = 25 °C; Z_s = optimum.

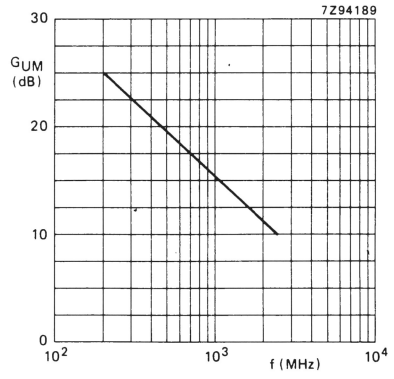


Fig. 5 $-V_{CE}$ = 8 V; $-I_C$ = 30 mA; T_{amb} = 25 °C.

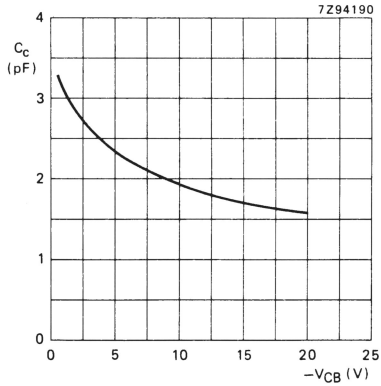


Fig. 6 $-I_E = -I_e$ = 0; f = 1 MHz; T_j = 25 °C.

$-V_{CE}$ = 10 V
$-I_C$ = 50 mA
T_{amb} = 25 °C

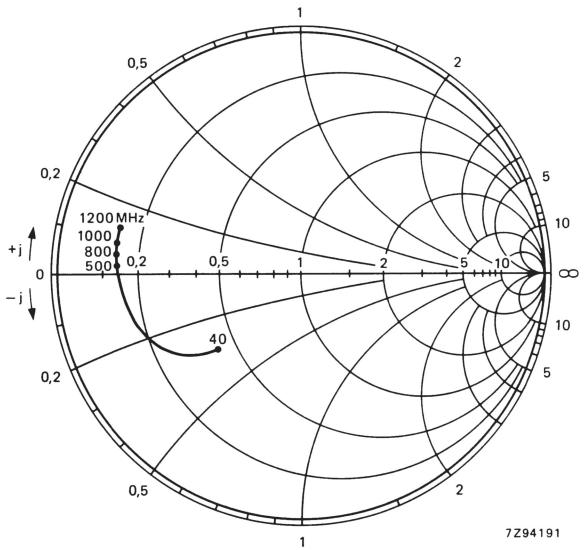
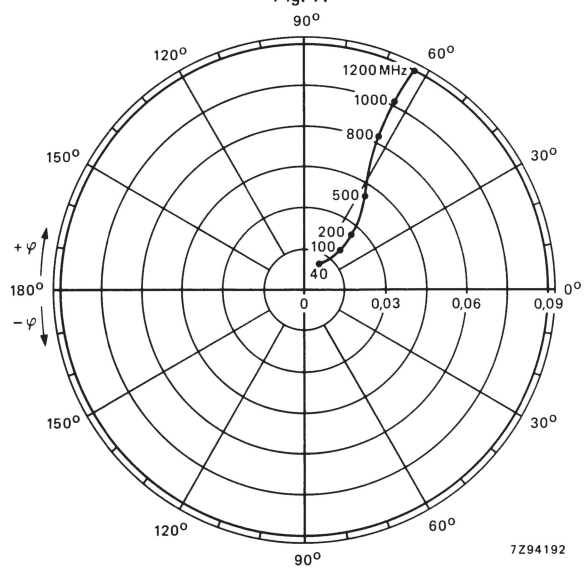


Fig. 7.

Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

$-V_{CE}$ = 10 V
$-I_C$ = 50 mA
T_{amb} = 25 °C



Reverse transmission coefficient s_{re}.

Fig. 8.

$-V_{CE}$ = 10 V
$-I_C$ = 50 mA
T_{amb} = 25 °C

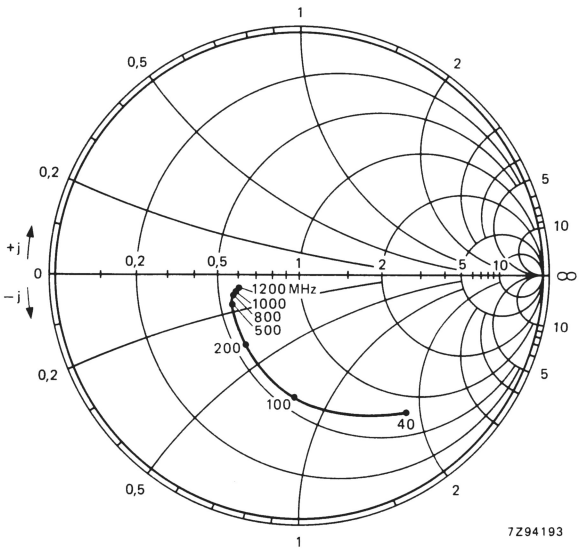


Fig. 9.

Uotput impedance derived from output reflection coefficient s_{oe} co-ordinates on ohm x 50.

$-V_{CE}$ = 10 V
$-I_C$ = 50 mA
T_{amb} = 25 °C

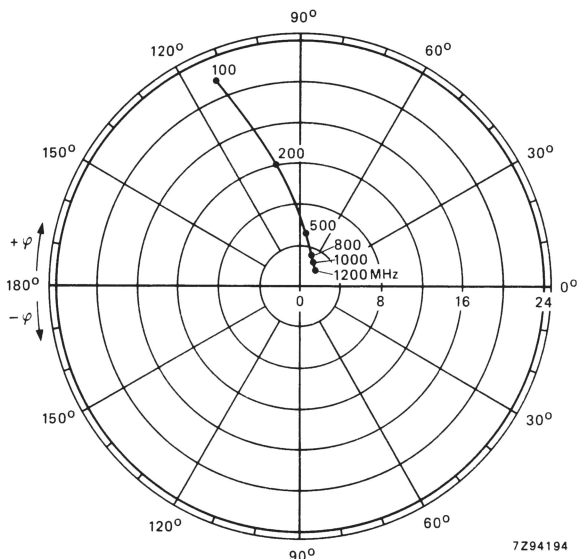


Fig. 10.

Forward transmission coefficient s_{fe}.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package.

It is intended for use in u.h.f. applications such as braodcast aerial amplifiers and in microwave amplifiers such as radar systems, spectrum analysers etc.

The BFQ32S offers a high transition frequency and a low modulation distortion figure over a wide current range.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	100 mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700 mW
Junction temperature	T_j	max.	175 °C
Transition frequency at f = 500 MHz $-I_C$ = 70 mA; $-V_{CE}$ = 10 V	f_T	typ.	4,5 GHz
Intermodulation distortion at T_{amb} = 25 °C $-I_C$ = 70 mA; $-V_{CE}$ = 10 V $f_{(p+q-r)}$ = 793,25 MHz	d_{im}	typ.	−60 dB

MECHANICAL DATA (see Fig. 1)

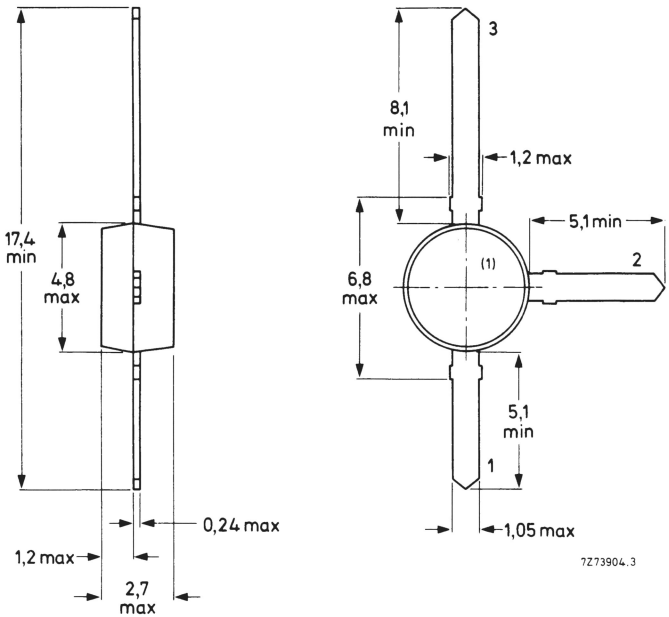
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	3	V
Collector current (d.c.)	$-I_C$	max.	100	mA
Total power dissipation up to T_{amb} = 70 °C mounted on a fibre-glass print of 50 mm x 50 mm x 1,5 mm (see Fig. 2)	P_{tot}	max.	700	mW
Storage temperature	T_{stg}	−65 to +	175	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 50 mm x 50 mm x 1,5 mm (see Fig. 2)	$R_{th\ j\text{-}a}$	=	150	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; $-V_{CB}$ = 10 V	$-I_{CBO}$	<	100 nA
D.C. current gain			
$-I_C$ = 70 mA; $-V_{CE}$ = 10 V	h_{FE}	>	20
Transition frequency at f = 500 MHz			
$-I_C$ = 70 mA; $-V_{CE}$ = 10 V	f_T	=	4,5 GHz
Collector capacitance at f = 1 MHz			
I_E = 0; $-V_{CB}$ = 10 V	C_c	=	1,8 pF
Emitter capacitance at f = 1 MHz			
I_C = 0; $-V_{EB}$ = 0,5 V	C_e	=	6 pF
Feedback capacitance at f = 1 MHz			
$-I_C$ = 0; $-V_{CE}$ = 0	C_{re}	typ.	1,3 pF
Intermodulation distortion			
$-I_C$ = 70 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C			
$V_p = V_o$ = 600 mV at f_p = 795,25 MHz $V_q = V_o$ −6 dB at f_q = 803,25 MHz $V_r = V_o$ −6 dB at f_r = 805,25 MHz			
Measured at $f_{(p+q-r)}$ = 793,25 MHz	d_{im}	=	−60 dB

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM}
10	40	0,62/ 22,5°	21,91/134,4°	0,05/ 55,85°	0,84/ 50,5°	34,2
	100	0,61/ 19,9°	22,51/134,2°	0,05/ 54,55°	0,83/ 34,9°	34,2
	200	0,62/ 22,1°	22,15/136,0°	0,05/ 54,13°	0,84/ 50,4°	34,4
	500	0,61/ 17,6°	22,27/134,5°	0,05/ 55,40°	0,84/ 46,5°	34,3
	800	0,61/ 23,9°	22,44/134,3°	0,05/ 52,00°	0,84/ 46,3°	34,3
	1000	1,03/−178,8°	1,09/ 0,5°	1,03/−1,30°	1,06/ 179,9°	21,3
	1200	0,56/−173,5°	4,30/ 85,6°	0,09/ 54,63°	0,23/−103,0°	14,5
	1500	0,59/ 150,5°	1,79/ 53,4°	0,18/ 56,40°	0,23/−164,3°	7,1
	2000	0,62/ 115,7°	1,00/ 9,9°	0,29/ 29,45°	0,29/−162,5°	2,4
20	40	0,46/ −4,5°	30,13/130,6°	0,05/ 45,95°	0,74/ 37,9°	34,0
	100	0,45/ −5,0°	30,50/128,9°	0,05/ 49,93°	0,73/ 22,9°	34,0
	200	0,45/ −3,5°	30,79/127,2°	0,05/ 50,78°	0,74/ 37,5°	34,2
	500	0,45/ −8,3°	30,04/129,7°	0,05/ 49,95°	0,75/ 34,1°	34,1
	800	0,45/ −2,2°	30,55/128,3°	0,04/ 49,00°	0,75/ 34,0°	34,2
	1000	0,99/ 178,3°	1,13/ −0,9°	1,04/ 0,68°	1,11/ 177,3°	23,3
	1200	0,55/ 178,5°	4,81/ 84,6°	0,09/ 64,88°	0,23/−133,9°	15,4
	1500	0,59/ 150,2°	1,98/ 55,9°	0,19/ 59,10°	0,23/−162,1°	8,1
	2000	0,55/ 108,5°	1,06/ 11,1°	0,32/ 28,28°	0,27/ 179,2°	2,3
30	40	0,39/ −21,2°	33,66/125,8°	0,04/ 46,75°	0,68/ 31,7°	33,9
	100	0,40/ −23,2°	34,66/127,4°	0,05/ 49,53°	0,67/ 15,7°	34,1
	200	0,40/ −21,3°	33,92/127,7°	0,05/ 54,03°	0,68/ 31,4°	34,0
	500	0,39/ −25,4°	33,94/126,9°	0,05/ 45,90°	0,68/ 28,5°	34,1
	800	0,40/ −20,1°	33,65/126,6°	0,05/ 45,28°	0,68/ 29,3°	34,0
	1000	1,02/−178,6°	1,18/ 0,5°	1,02/ 0,08°	1,14/ 177,5°	20,6
	1200	0,54/ 175,4°	5,03/ 84,1°	0,09/ 69,00°	0,24/−145,5°	15,8
	1500	0,59/ 147,8°	2,07/ 56,2°	0,19/ 61,83°	0,25/−169,9°	8,5
	2000	0,58/ 107,9°	1,10/ 13,2°	0,33/ 27,68°	0,27/ 171,4°	3,0
50	40	0,38/ −40,9°	37,63/123,8°	0,04/ 46,70°	0,61/ 24,4°	34,2
	100	0,38/ −44,3°	37,01/122,4°	0,05/ 44,83°	0,61/ 9,2°	34,1
	200	0,38/ −42,7°	37,23/124,2°	0,04/ 42,95°	0,60/ 23,3°	34,0
	500	0,37/ −46,2°	37,00/124,3°	0,04/ 44,98°	0,61/ 19,9°	34,0
	800	0,38/ −40,3°	37,11/125,6°	0,04/ 45,50°	0,61/ 21,3°	34,1
	1000	1,01/ 179,2°	1,21/ −0,1°	1,01/−3,38°	1,19/ 177,8°	22,6
	1200	0,55/ 172,8°	5,14/ 83,6°	0,09/ 72,35°	0,26/−153,3°	16,1
	1500	0,60/ 148,3°	2,11/ 56,8°	0,20/ 62,43°	0,28/−174,8°	8,8
	2000	0,54/ 106,5°	1,13/ 14,0°	0,33/ 27,98°	0,28/ 165,0°	2,9
70	40	0,38/ −50,5°	37,89/122,3°	0,04/ 49,48°	0,56/ 20,5°	33,9
	100	0,38/ −51,8°	38,40/123,6°	0,04/ 49,93°	0,56/ 6,6°	34,0
	200	0,38/ −49,6°	38,10/124,1°	0,04/ 46,38°	0,56/ 22,8°	33,9
	500	0,38/ −54,7°	38,25/122,0°	0,04/ 42,23°	0,56/ 15,4°	34,0
	800	0,39/ −46,7°	37,71/124,0°	0,04/ 47,70°	0,56/ 16,2°	33,8
	1000	1,00/ 178,0°	1,23/ −2,6°	1,02/−3,63°	1,22/ 174,6°	30,1
	1200	0,55/ 171,7°	5,11/ 83,3°	0,09/ 73,90°	0,27/−157,1°	16,1
	1500	0,60/ 148,7°	2,10/ 56,6°	0,20/ 63,50°	0,29/−177,2°	8,7
	2000	0,64/ 106,1°	1,13/ 14,8°	0,33/ 26,88°	0,29/ 157,6°	3,7

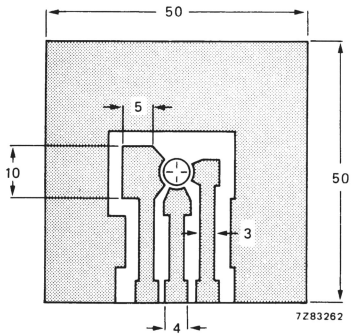


Fig. 2 Requirements for fibre-glass print (Dimensions in mm).
Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm.
Tracks are fully tin-plated. Shaded area is Cu.

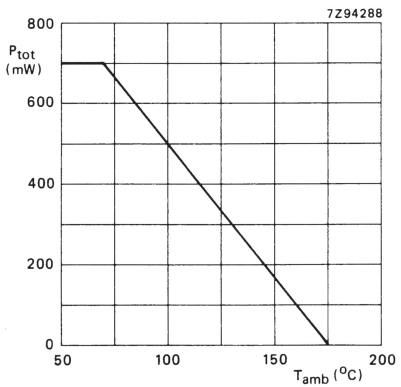


Fig. 3 Power dissipation.

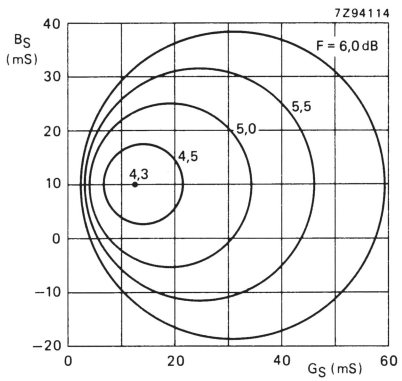


Fig. 4 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 50 mA; f = 800 MHz.

N-P-N MICROWAVE TRANSISTOR

The BFQ33 is a small-signal silicon planar epitaxial transistor in a miniature hermetically sealed microstripline encapsulation, featuring an extremely high transition frequency and very low noise up to high frequencies.

It is primarily intended for use in microwave amplifier applications.

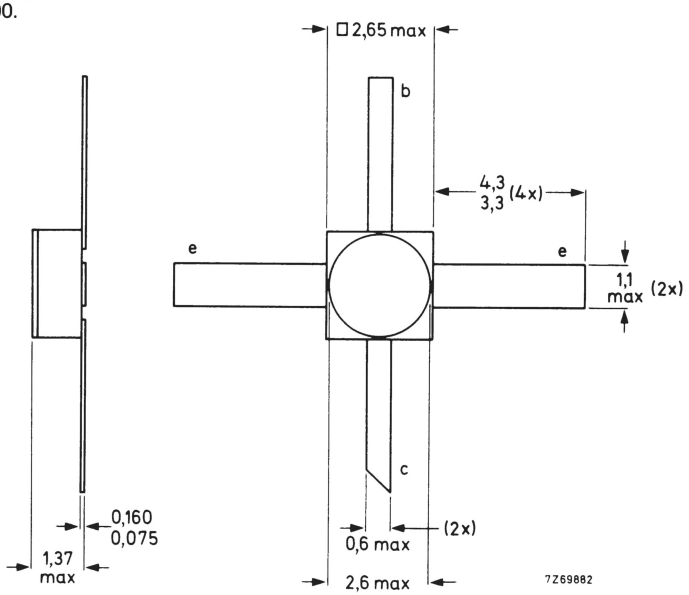
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to T_{amb} = 80 °C	P_{tot}	max.	140 mW
Transition frequency at f = 1,5 GHz I_C = 14 mA; V_{CE} = 5 V	f_T	typ.	12 GHz
Noise figure at optimum source impedance I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz	F	typ.	2,5 dB
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 5 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	13,7 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-100.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	9 V
Collector-emitter voltage (open base)	V_{CEO}	max.	7 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	20 mA
Total power dissipation up to T_{amb} = 80 °C	P_{tot}	max.	140 mW
Storage temperature	T_{stg}	−65 to + 150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500 K/W*

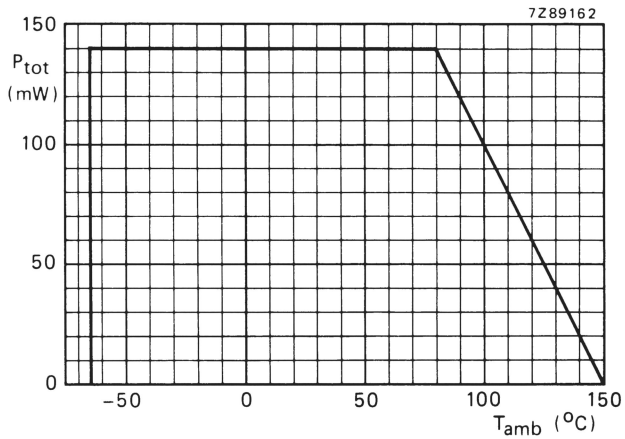


Fig. 2 Power derating curve versus ambient temperature.

* K/W is SI unit for °C/W.

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50 nA
D.C. current gain*			
I_C = 14 mA; V_{CE} = 5 V	h_{FE}	>	25
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 5 V	C_c	typ.	0,45 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,2 pF
Transition frequency at f = 1,5 GHz*			
I_C = 14 mA; V_{CE} = 5 V	f_T	typ.	12 GHz
Noise figure at optimum source impedance			
I_C = 5 mA; V_{CE} = 5 V; f = 2 GHz	F	typ.	2,5 dB
I_C = 5 mA; V_{CE} = 5 V; f = 4 GHz	F	typ.	3,8 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 14 mA; V_{CE} = 5 V; f = 2 GHz	G_{UM}	typ.	13,7 dB
I_C = 14 mA; V_{CE} = 5 V; f = 4 GHz	G_{UM}	typ.	7,4 dB
s-parameters (common emitter)			
I_C = 14 mA; V_{CE} = 5 V; $R_S = R_L$ = 50 Ω; f = 2 GHz			
Input reflection coefficient	s_{ie}	typ.	0,18/−155°
Reverse transmission coefficient	s_{re}	typ.	0,10/ +49°
Forward transmission coefficient	s_{fe}	typ.	4,3 / +75°
Output reflection coefficient	s_{oe}	typ.	0,43/ −56°
I_C = 14 mA; V_{CE} = 5 V; $R_S = R_L$ = 50 Ω; f = 4 GHz			
Input reflection coefficient	s_{ie}	typ.	0,19/+ 171°
Reverse transmission coefficient	s_{re}	typ.	0,14/ +34°
Forward transmission coefficient	s_{fe}	typ.	2,0 / +48°
Output reflection coefficient	s_{oe}	typ.	0,50/ −89°

* Measured under pulse conditions.

Conditions for Figs 3 and 4:

V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C.

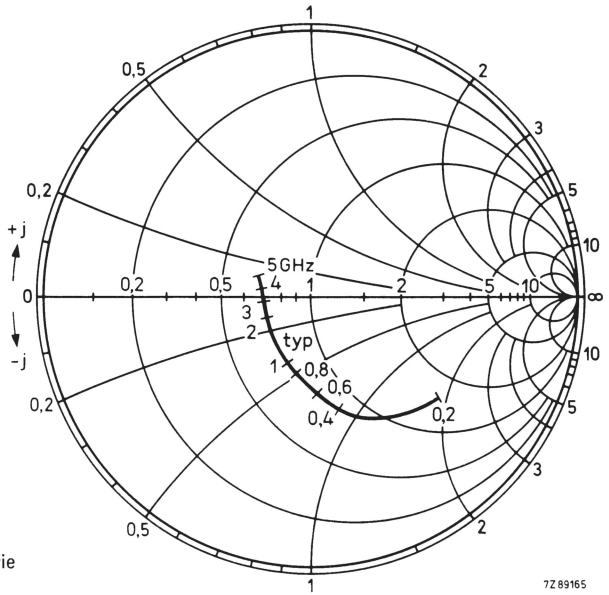


Fig. 3 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

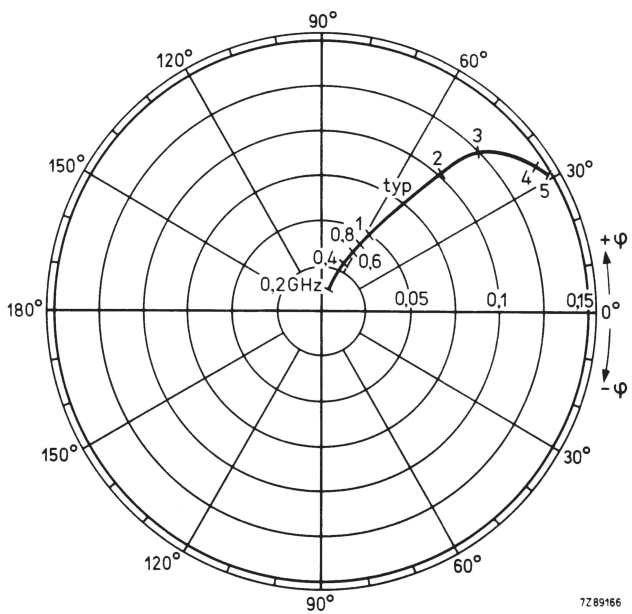


Fig. 4 Reverse transmission coefficient s_{re}.

Conditions for Figs 5 and 6:

V_{CE} = 5 V; I_C = 14 mA;
T_{amb} = 25 °C.

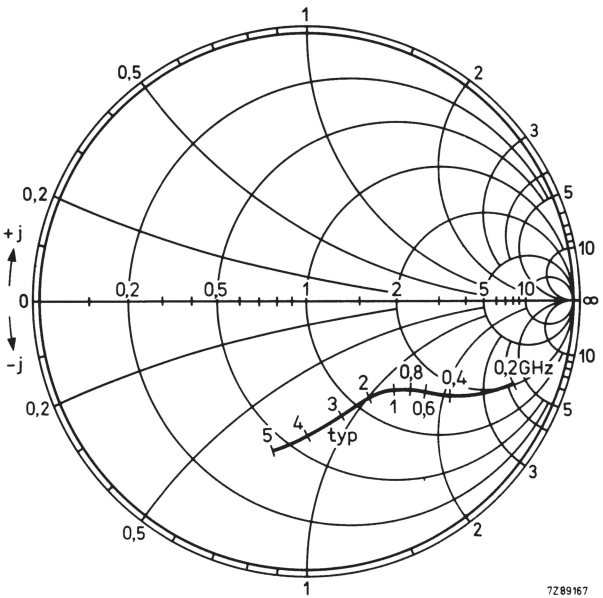


Fig. 5 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

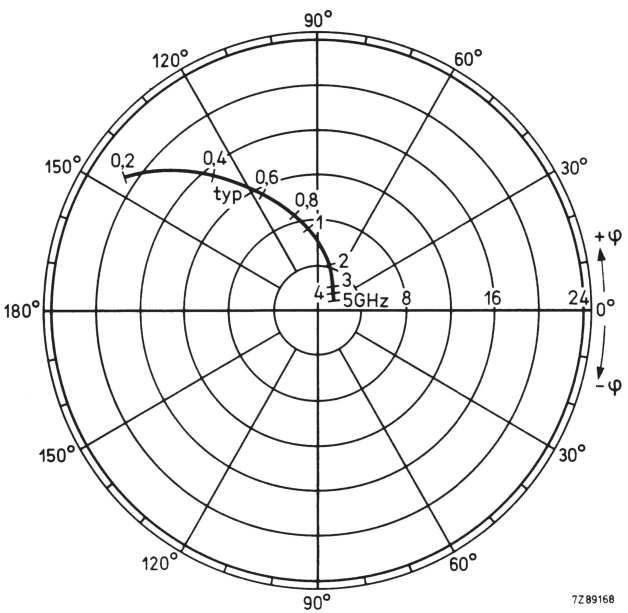


Fig. 6 Forward transmission coefficient s_{fe}.

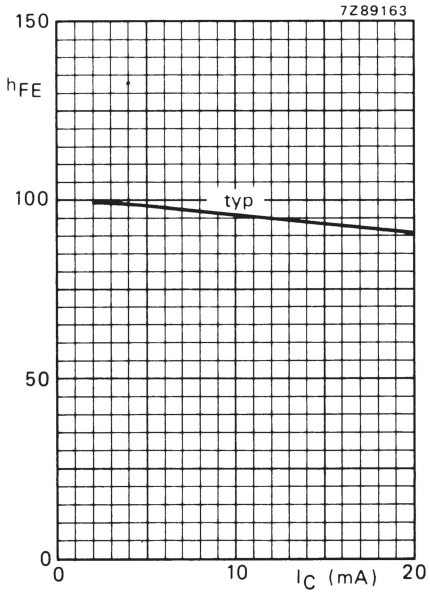


Fig. 7 V_{CE} = 5 V; T_j = 25 °C.

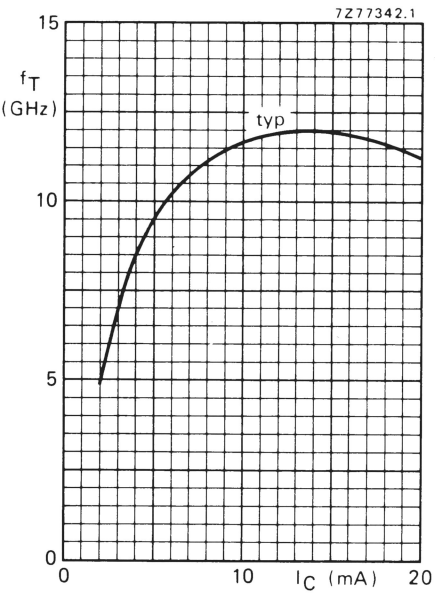


Fig. 8 V_{CE} = 5 V; f = 1,5 GHz; T_j = 25 °C.

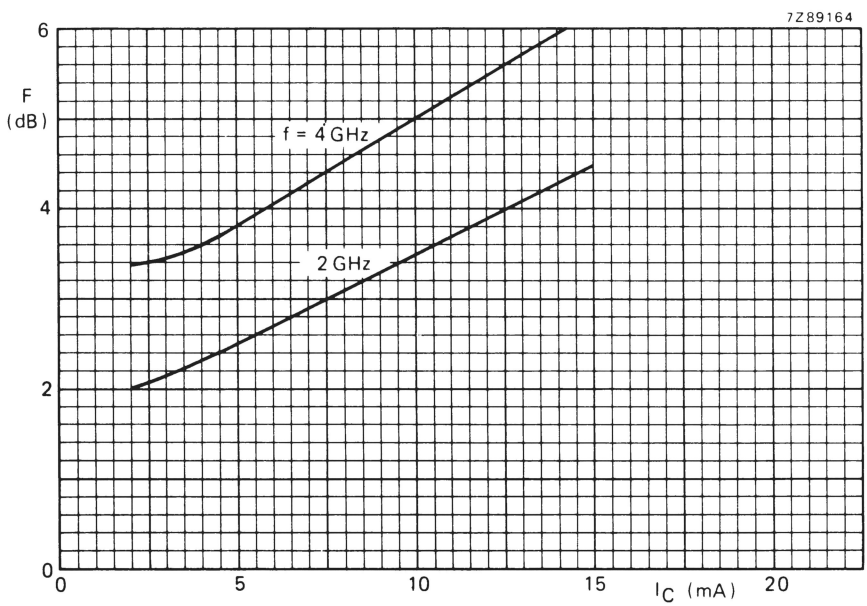


Fig. 9 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor primarily intended for driver and final stages in MATV system amplifiers. This device is also suitable for use in low power band IV and V equipment. Diffused emitter ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Collector current (d.c.)	I_C	max.	150	mA
Total power dissipation (d.c.) up to T_{mb} = 125 °C	P_{tot}	max.	2,25	W
Operating junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 150 mA; V_{CE} = 15 V; T_j = 25 °C	f_T	>	3,5	GHz
Output voltage at d_{im} = −60 dB (see Figs 2 and 4) I_C = 120 mA; V_{CE} = 15 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	1,2	V
Output power at 1 dB gain compression	P_{L1}	typ.	+26	dBm
Third order intercept point	ITO	typ.	+45	dBm

MECHANICAL DATA

SOT-122 (see Fig. 1).

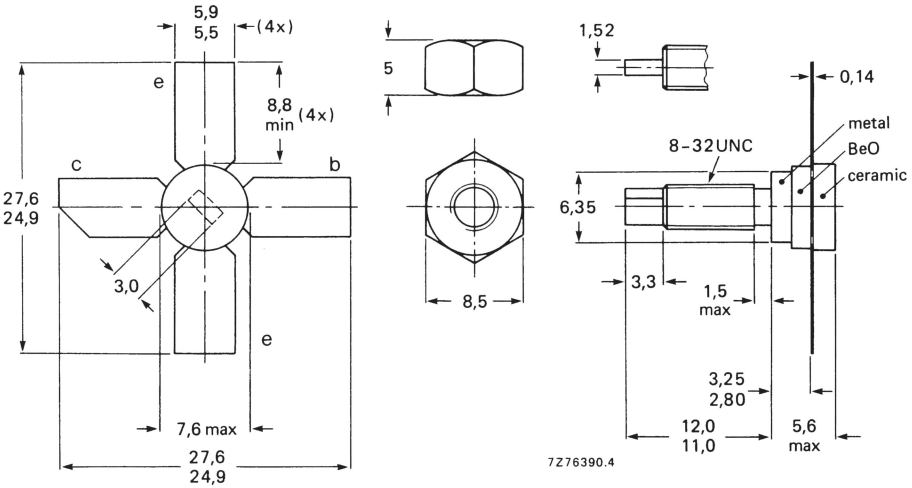
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base) (see Fig. 3)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation (d.c.) up to T_{mb} = 125 °C (see Fig. 3)	P_{tot}	max.	2,25 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$ =	15,0 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$ =	0,6 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 15 V	I_{CBO}	<	100 μA
D.C. current gain*			
I_C = 75 mA; V_{CE} = 15 V	h_{FE}	>	25
I_C = 150 mA; V_{CE} = 15 V	h_{FE}	>	25
Transition frequency at f = 500 MHz*			
I_C = 75 mA; V_{CE} = 15 V	f_T	>	3,0 GHz
		typ.	3,5 GHz
I_C = 150 mA; V_{CE} = 15 V	f_T	>	3,5 GHz
		typ.	4,0 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ.	2,0 pF
		<	2,75 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	11 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 15 V	C_{re}	typ.	1,0 pF
		<	1,35 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF
Noise figure measured in MATV test circuit (see Fig. 2)			
I_C = 120 mA; V_{CE} = 15 V; f = 500 MHz	F	typ.	8 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 120 mA; V_{CE} = 15 V; f = 500 MHz	G_{UM}	typ.	16,3 dB
Output voltage at d_{im} = −60 dB (see Figs 2 and 4) (DIN 45004B, par. 6.3.: 3-tone) I_C = 120 mA; V_{CE} = 15 V; R_L = 75 Ω			
$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz			
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz			
$R_r = V_o$ −6 dB ; f_r = 805,25 MHz			
measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	1,2 V

* Measured under pulse conditions.

→ Output power at 1 dB gain compression (see Fig. 2)
I_C = 120 mA; V_{CE} = 15 V
R_L = 75 Ω
measured at f = 800 MHz — P_{L1} typ. +26 dBm

→ Third order intercept point (see Fig. 2)
I_C = 120 mA; V_{CE} = 15 V
R_L = 75 Ω
P_p = ITO − 6 dB; f_p = 800 MHz
P_q = ITO − 6 dB; f_q = 801 MHz
measured at $f_{(2q-p)}$ = 802 MHz and
at $f_{(2p-q)}$ = 799 MHz — ITO typ. +45 dBm

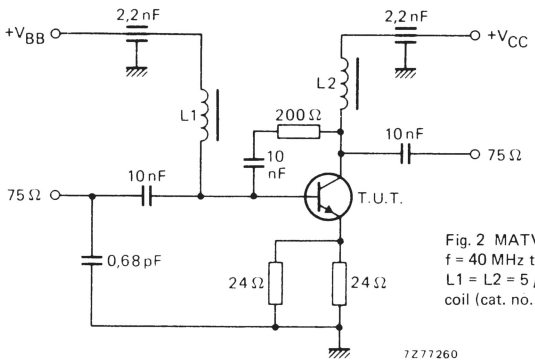


Fig. 2 MATV test circuit
f = 40 MHz to 860 MHz.
L1 = L2 = 5 μH Ferroxcube coil (cat. no. 3122 108 20153).

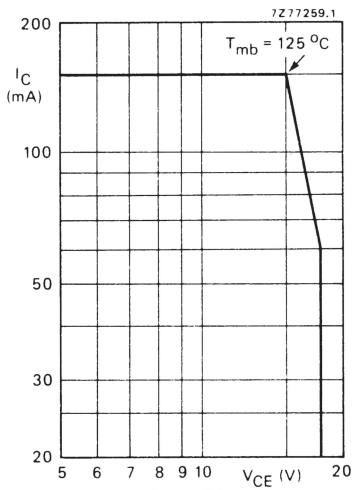


Fig. 3 D.C. SOAR.

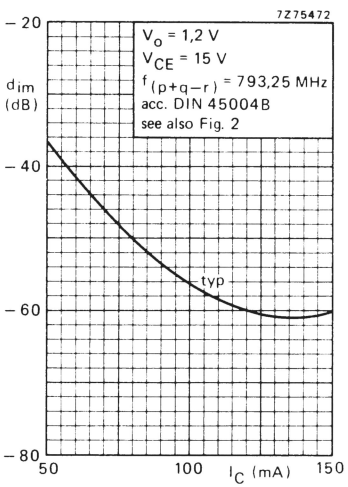


Fig. 4.

s-parameters (common emitter) at V_{CE} = 7,5 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
50	40	0,47/ −72°	0,02/64°	30,5/147°	0,85/ −34°
	200	0,55/−154°	0,06/52°	11,3/101°	0,36/ −84°
	500	0,54/+ 177°	0,08/58°	4,9/ 78°	0,25/−104°
	800	0,52/+ 160°	0,12/58°	3,2/ 63°	0,25/−113°
	1000	0,50/+ 150°	0,15/57°	2,6/ 54°	0,26/−118°
	1200	0,48/+ 142°	0,18/54°	2,2/ 46°	0,28/−122°
75	40	0,45/ −76°	0,02/64°	32,1/144°	0,83/ −36°
	200	0,54/−156°	0,05/53°	11,6/100°	0,35/ −90°
	500	0,54/+ 176°	0,08/59°	5,0/ 78°	0,24/−112°
	800	0,51/+ 160°	0,13/59°	3,3/ 63°	0,24/−121°
	1000	0,49/+ 150°	0,16/57°	2,7/ 55°	0,24/−124°
	1200	0,46/+ 142°	0,18/54°	2,3/ 47°	0,26/−128°
100	40	0,44/ −79°	0,02/63°	33,0/145°	0,82/ −37°
	200	0,54/−157°	0,06/54°	11,8/100°	0,35/ −93°
	500	0,53/+ 175°	0,09/60°	5,1/ 78°	0,23/−117°
	800	0,51/+ 159°	0,13/59°	3,3/ 64°	0,23/−126°
	1000	0,49/+ 150°	0,16/57°	2,7/ 55°	0,24/−129°
	1200	0,46/+ 142°	0,19/54°	2,3/ 47°	0,26/−131°
120	40	0,43/ −81°	0,02/63°	33,5/145°	0,82/ −38°
	200	0,54/−157°	0,05/55°	11,9/ 99°	0,35/ −95°
	500	0,53/+ 175°	0,09/60°	5,1/ 77°	0,23/−119°
	800	0,51/+ 159°	0,13/59°	3,3/ 63°	0,23/−128°
	1000	0,48/+ 149°	0,16/56°	2,7/ 55°	0,24/−131°
	1200	0,46/+ 141°	0,19/53°	2,3/ 47°	0,25/−132°
150	40	0,43/ −82°	0,02/63°	33,6/145°	0,81/ −39°
	200	0,54/−158°	0,05/55°	11,8/ 99°	0,34/ −96°
	500	0,53/+ 175°	0,09/60°	5,1/ 77°	0,23/−121°
	800	0,51/+ 159°	0,13/59°	3,3/ 63°	0,23/−129°
	1000	0,49/+ 149°	0,16/56°	2,7/ 55°	0,24/−132°
	1200	0,47/+ 141°	0,19/53°	2,3/ 47°	0,25/−134°

s-parameters (common emitter) at V_{CE} = 15 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
50	40	0,48/ −65°	0,02/62°	31,0/148°	0,83/ −30°
	200	0,53/−149°	0,04/52°	12,0/102°	0,37/ −73°
	500	0,52/+ 179°	0,08/58°	5,2/ 78°	0,25/ −89°
	800	0,50/+ 162°	0,12/59°	3,4/ 64°	0,26/ −99°
	1000	0,47/+ 152°	0,14/57°	2,8/ 55°	0,28/−104°
	1200	0,45/+ 144°	0,17/55°	2,3/ 47°	0,31/−109°
75	40	0,46/ −68°	0,02/62°	32,9/148°	0,82/ −32°
	200	0,52/−151°	0,04/53°	12,5/101°	0,36/ −79°
	500	0,51/+ 178°	0,08/59°	5,4/ 78°	0,24/ −97°
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,24/−106°
	1000	0,46/+ 152°	0,15/57°	2,8/ 56°	0,26/−110°
	1200	0,44/+ 144°	0,17/55°	2,4/ 48°	0,28/−114°
100	40	0,47/ −69°	0,02/62°	33,9/147°	0,81/ −34°
	200	0,51/−151°	0,04/54°	12,6/101°	0,35/ −82°
	500	0,50/+ 178°	0,08/59°	5,5/ 78°	0,23/−101°
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,23/−109°
	1000	0,45/+ 152°	0,15/57°	2,9/ 56°	0,25/−113°
	1200	0,43/+ 144°	0,18/54°	2,4/ 48°	0,27/−117°
120	40	0,47/ −69°	0,02/62°	34,6/146°	0,81/ −34°
	200	0,51/−151°	0,04/54°	12,7/101°	0,35/ −83°
	500	0,50/+ 178°	0,08/60°	5,5/ 78°	0,23/−103°
	800	0,48/+ 161°	0,12/59°	3,5/ 64°	0,23/−112°
	1000	0,45/+ 152°	0,15/57°	2,9/ 56°	0,24/−115°
	1200	0,43/+ 144°	0,18/54°	2,4/ 48°	0,26/−118°
150	40	0,49/ −70°	0,02/61°	34,8/146°	0,80/ −35°
	200	0,52/−152°	0,04/54°	12,6/100°	0,34/ −84°
	500	0,50/+ 178°	0,08/60°	5,4/ 78°	0,23/−103°
	800	0,48/+ 162°	0,12/59°	3,5/ 64°	0,23/−111°
	1000	0,46/+ 152°	0,15/57°	2,8/ 55°	0,24/−114°
	1200	0,44/+ 144°	0,18/54°	2,4/ 48°	0,27/−117°

Conditions for Figs 5 and 6:
V_{CE} = 15 V; I_C = 120 mA;
T_{amb} = 25 °C.

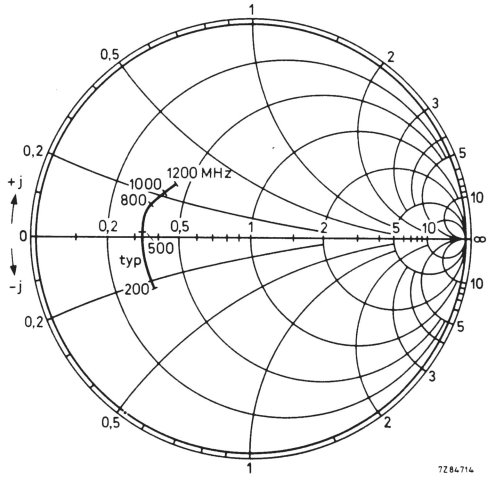


Fig. 5 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

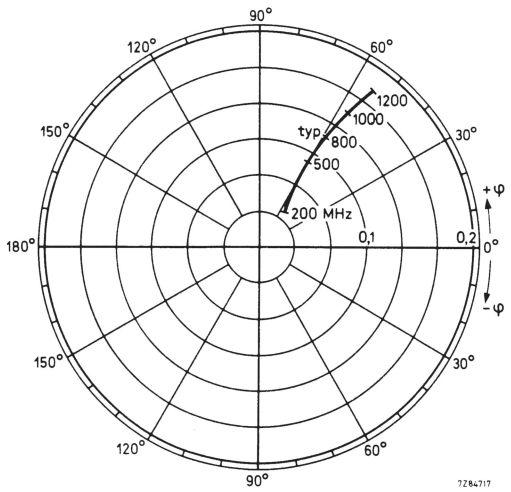


Fig. 6 Reverse transmission coefficient s_{re}.

Conditions for Figs 7 and 8:
V_{CE} = 15 V; I_C = 120 mA;
T_{amb} = 25 °C.

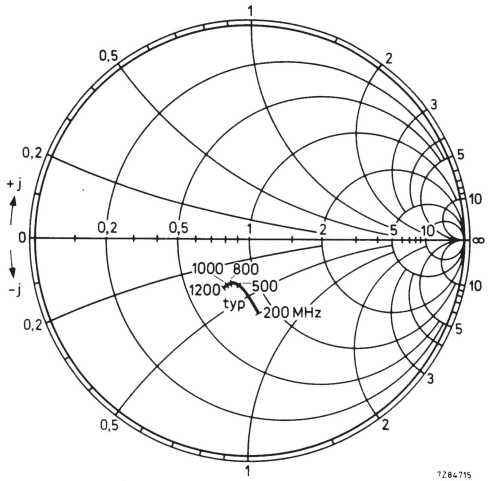


Fig. 7 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

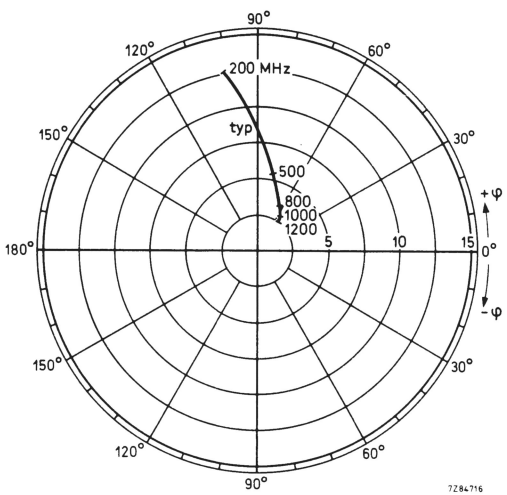


Fig. 8 Forward transmission coefficient s_{fe}.

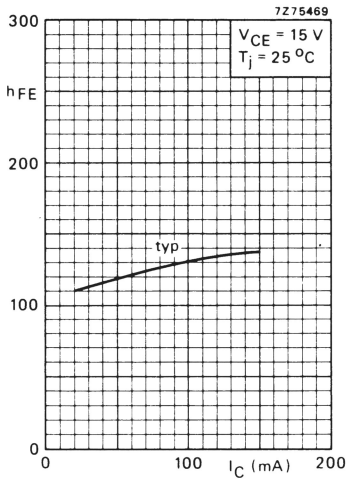


Fig. 9.

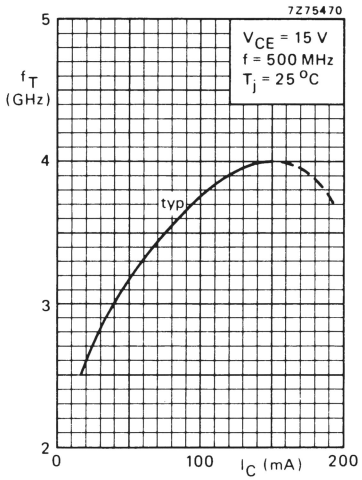


Fig. 10.

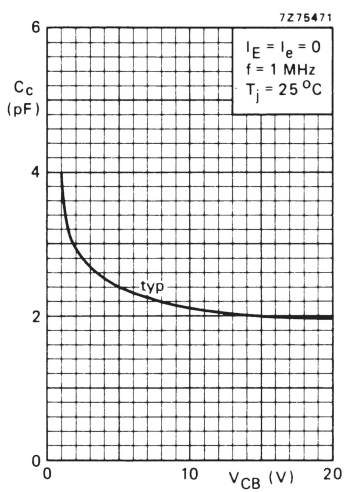


Fig. 11.

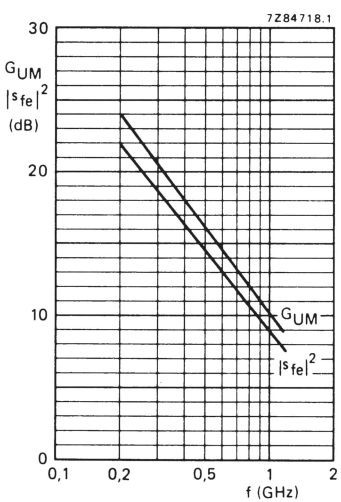


Fig. 12 V_{CE} = 15 V; I_C = 120 mA; T_{amb} = 25 °C; typical values

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in plastic T-package, intended for wideband amplification applications. The device features high output voltage capabilities.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Collector current (d.c.)	I_C	max.	150	mA
Total power dissipation up to T_{amb} = 45 °C	P_{tot}	max.	1	W
Junction temperature	T_j	max.	175	°C
D.C. current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25	
Transition frequency at f = 500 MHz I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7	GHz
Maximum power gain at f = 300 MHz; T_{amb} = 25 °C I_C = 100 mA; V_{CE} = 10 V	G_{PM}	typ.	20	dB
Output voltage at d_{im} = –60 dB (see Fig. 3) I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; $f_{(p+q-r)}$ = 285,25 MHz; T_{amb} = 25 °C	V_o	typ.	1	V
Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz	P_{L1}	typ.	+ 24	dBm
Third order intercept point V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz	ITO	typ.	+ 43	dBm

MECHANICAL DATA

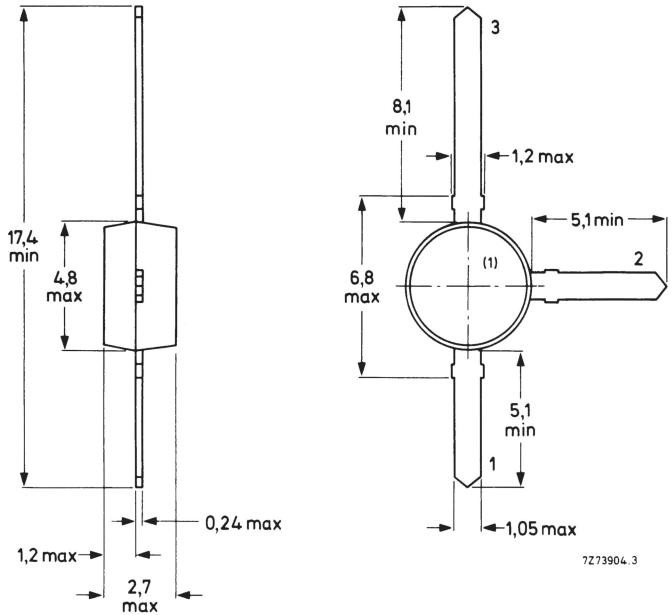
SOT-37 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections:
1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (d.c.)	I_C	max.	150	mA
Total power dissipation up to T_{amb} = 45 °C (see Fig. 2)	P_{tot}	max.	1	W
Storage temperature	T_{stg}		−65 to + 175	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to case	$R_{th\ j\text{-}c}$	=	50 K/W
From junction to ambient (free air) mounted on a fibre-glass print (see Fig. 2)	$R_{th\ j\text{-}a}$	=	130 K/W

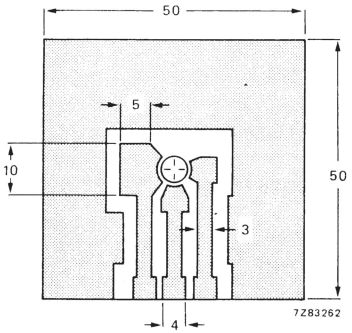


Fig. 2 Requirements for fibre-glass print (Dimensions in mm). Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-plated. Shaded area is Cu.

CHARACTERISTICS

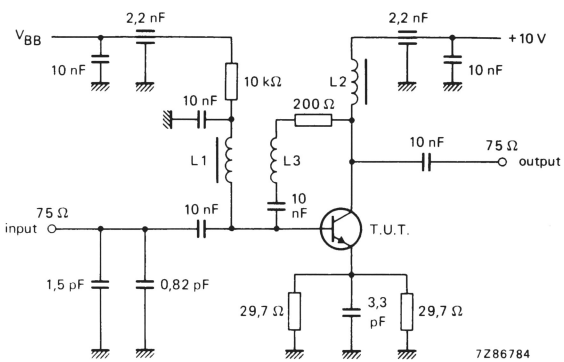
T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 15 V	I_{CBO}	max.	100 μA
D.C. current gain* I_C = 100 mA; V_{CE} = 10 V	h_{FE}	min.	25
Transition frequency at f = 500 MHz* I_C = 100 mA; V_{CE} = 10 V	f_T	typ.	3,7 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 10 V	C_c	typ.	2,0 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	10 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1,2 pF
Maximum power gain at f = 300 MHz; T_{amb} = 25 °C I_C = 100 mA; V_{CE} = 10 V	G_{UM}	typ.	20 dB
Second harmonic distortion (see Fig. 3) I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $V_p = V_o$ = 316 mV = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 316 mV = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	typ.	−55 dB

* Measured under pulse conditions.

CHARACTERISTICS (continued)

Output voltage at d_{im} = −60 dB (see Fig. 3) (DIN 45004B); T_{amb} = 25 °C; I_C = 100 mA; V_{CE} = 10 V; R_L = 75 Ω $V_p = V_o$ at d_{im} = −60 dB; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 295,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	typ.	1 V
Output voltage at d_{im} = −60 dB (see Fig. 3) (DIN 45004B); T_{amb} = 25 °C; I_C = 90 mA; V_{CE} = 10 V; R_L = 75 Ω $V_p = V_o$ at d_{im} = −60 dB; f_p = 797,25 MHz $V_q = V_o$ −6 dB; f_q = 803,25 MHz $V_r = V_o$ −6 dB; f_r = 805,25 MHz Measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	750 mV
→ Output power at 1 dB gain compression V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	P_{L1}	typ. typ.	+ 24 dBm + 22 dBm
→ Third order intercept point V_{CE} = 10 V; I_C = 100 mA; f = 300 MHz V_{CE} = 10 V; I_C = 90 mA; f = 800 MHz	ITO	typ. typ.	+ 43 dBm + 41 dBm



BFQ34T

Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L2 = 5 μH Ferroxcube choke
L3 = 2 turns Cu wire (0,5 mm), internal diameter 4 mm, winding pitch 2 mm.

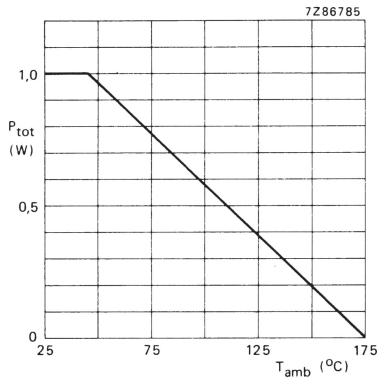


Fig. 4.

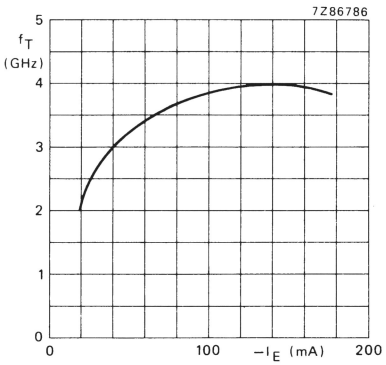


Fig. 5 V_{CE} = 10 V; f = 500 MHz.

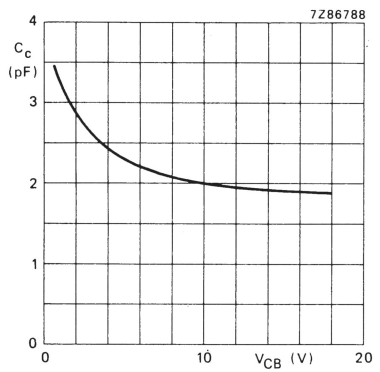


Fig. 6 I_E = 0; f = 1 MHz.

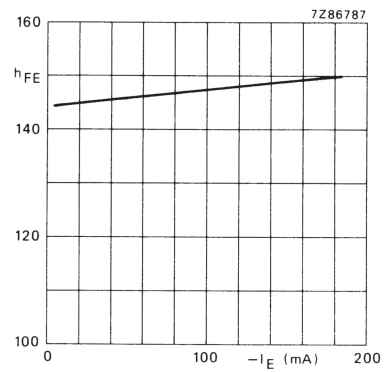


Fig. 7 V_{CE} = 10 V.

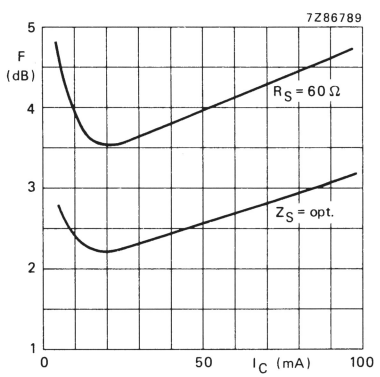


Fig. 8 V_{CE} = 10 V; f = 800 MHz.

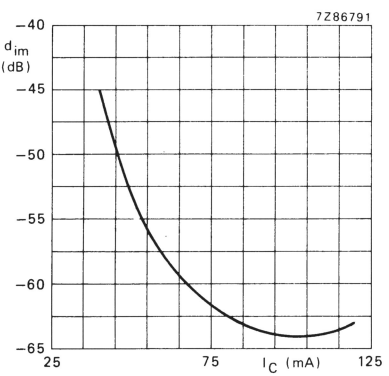


Fig. 9 V_{CE} = 10 V; V_o = 58 dBmV; $f_{(p+q-r)}$ = 285,25 MHz.

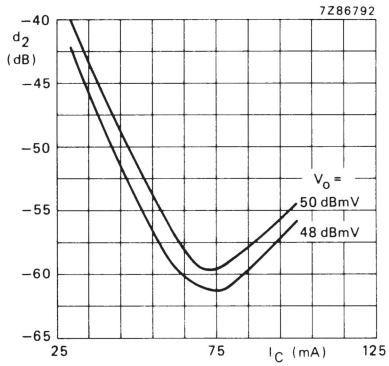


Fig. 10 V_{CE} = 10 V; f_p = 66 MHz; z. f_p = 144 MHz; $f_{(p+q)}$ = 210 MHz.

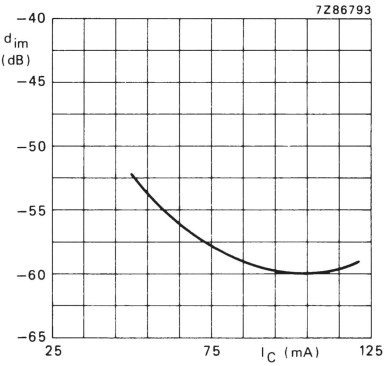


Fig. 11 V_{CE} = 19 V; V_o = 750 mV; $f_{(p+q-r)}$ = 793,25 MHz.

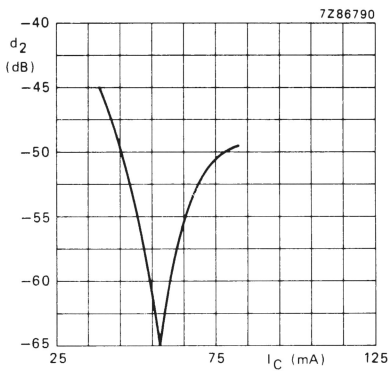


Fig. 12 V_{CE} = 10 V; V_o = 48 dBmV; f_p = 560 MHz; f_q = 250 MHz; $f_{(p+q)}$ = 810 MHz.

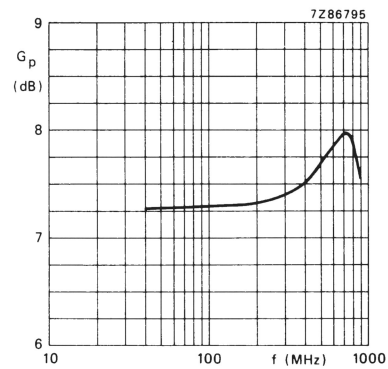


Fig. 13 Gain measured in test circuit (see Fig. 3).

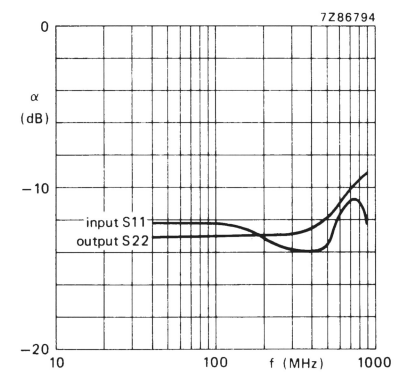


Fig. 14 Return losses measured in test circuit (see Fig. 3).

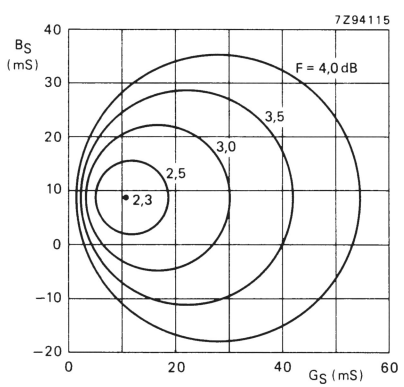


Fig. 15 Circles of constant noise figure. V_{CE} = 10 V; I_C = 20 mA; f = 800 MHz.

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
10	40	0,81/ 30,7°	19,84/135,8°	0,05/ 50,18°	0,88/ 59,0°	37,2
	100	0,81/ 30,1°	19,83/136,6°	0,05/ 49,73°	0,88/ 43,2°	37,2
	200	0,81/ 31,0°	19,97/136,7°	0,05/ 52,60°	0,88/ 59,7°	37,3
	500	0,82/ 27,3°	19,94/135,5°	0,05/ 55,33°	0,88/ 54,9°	37,4
	800	0,81/ 32,8°	20,07/134,6°	0,05/ 52,90°	0,88/ 55,1°	37,3
	1000	1,00/ 178,3°	1,11/ −1,1°	1,01/−1,43°	1,05/ 178,8°	32,4
	1200	0,59/−166,4°	4,47/ 85,1°	0,07/ 51,60°	0,34/ −60,7°	15,4
	1500	0,63/ 156,7°	1,85/ 49,6°	0,14/ 67,25°	0,39/ −43,0°	8,3
	2000	0,61/ 111,1°	0,87/ 23,0°	0,30/ 66,70°	0,44/−153,3°	1,7
20	40	0,73/ 20,8°	28,61/132,4°	0,05/ 49,40°	0,84/ 48,8°	37,8
	100	0,75/ 20,9°	28,40/131,4°	0,05/ 50,28°	0,83/ 34,9°	37,7
	200	0,74/ 22,1°	28,61/133,4°	0,05/ 52,60°	0,84/ 51,5°	37,9
	500	0,74/ 15,8°	28,59/131,5°	0,05/ 53,60°	0,83/ 46,1°	37,8
	800	0,74/ 24,0°	28,38/133,3°	0,05/ 45,70°	0,83/ 46,4°	37,5
	1000	1,01/ 178,5°	1,12/ −0,4°	1,01/−2,20°	1,10/ 177,1°	23,7
	1200	0,54/−171,1°	5,35/ 85,3°	0,08/ 52,53°	0,25/ −80,4°	16,3
	1500	0,57/ 153,3°	2,20/ 53,5°	0,16/ 65,95°	0,28/ 19,4°	8,9
	2000	0,55/ 111,8°	1,10/ 7,6°	0,40/ 41,03°	0,35/−156,6°	3,0
50	40	0,67/ 13,0°	37,46/126,9°	0,05/ 47,55°	0,78/ 40,0°	38,2
	100	0,66/ 10,8°	37,31/128,7°	0,05/ 45,45°	0,78/ 25,4°	37,9
	200	0,67/ 14,9°	37,19/127,4°	0,05/ 45,65°	0,79/ 40,9°	38,2
	500	0,66/ 8,2°	37,21/129,1°	0,05/ 47,73°	0,79/ 36,4°	38,1
	800	0,67/ 13,6°	36,81/129,5°	0,05/ 44,08°	0,78/ 37,9°	38,0
	1000	1,02/ 177,3°	1,16/ 0,6°	1,00/ 0,33°	1,14/ 177,0°	20,3
	1200	0,50/−175,0°	6,06/ 85,4°	0,08/ 64,95°	0,21/−108,5°	17,1
	1500	0,54/ 151,4°	2,50/ 56,9°	0,17/ 63,83°	0,23/−166,0°	9,7
	2000	0,50/ 111,4°	1,27/ 11,9°	0,31/ 36,40°	0,29/−162,8°	3,7
70	40	0,64/ 11,9°	39,04/128,8°	0,05/ 47,53°	0,76/ 37,0°	37,9
	100	0,65/ 10,4°	38,98/126,9°	0,05/ 48,30°	0,77/ 23,3°	38,2
	200	0,65/ 11,7°	39,17/128,1°	0,05/ 47,50°	0,76/ 38,4°	38,0
	500	0,65/ 5,1°	38,92/127,8°	0,05/ 46,68°	0,77/ 33,0°	38,1
	800	0,64/ 12,5°	39,31/128,5°	0,05/ 51,75°	0,76/ 34,0°	38,0
	1000	1,02/−177,5°	1,19/ −0,4°	1,02/ 1,88°	1,18/−179,7°	19,5
	1200	0,49/−175,9°	6,13/ 85,3°	0,08/ 65,75°	0,20/−115,4°	17,1
	1500	0,53/ 154,7°	2,52/ 57,1°	0,18/ 63,40°	0,23/−159,9°	9,7
	2000	0,49/ 111,2°	1,29/ 12,4°	0,55/ 36,88°	0,28/−166,4°	3,8
100	40	0,64/ 10,2°	39,77/127,5°	0,05/ 46,05°	0,75/ 35,6°	37,8
	100	0,63/ 7,2°	40,30/127,2°	0,05/ 43,45°	0,75/ 21,7°	37,9
	200	0,64/ 7,6°	40,45/128,1°	0,05/ 45,53°	0,75/ 35,3°	38,0
	500	0,64/ 3,3°	39,82/127,9°	0,04/ 46,38°	0,75/ 31,2°	37,8
	800	0,64/ 10,1°	39,81/127,6°	0,05/ 46,15°	0,75/ 33,4°	37,8
	1000	1,02/ 179,4°	1,20/ 2,1°	1,02/ 0,53°	1,19/ 177,6°	18,6
	1200	0,49/−176,6°	6,13/ 85,1°	0,08/ 66,10°	0,20/−119,8°	17,1
	1500	0,53/ 152,9°	2,53/ 56,5°	0,18/ 62,05°	0,23/−159,5°	9,8
	2000	0,49/ 111,2°	1,30/ 12,7°	0,31/ 35,30°	0,28/−168,6°	3,8

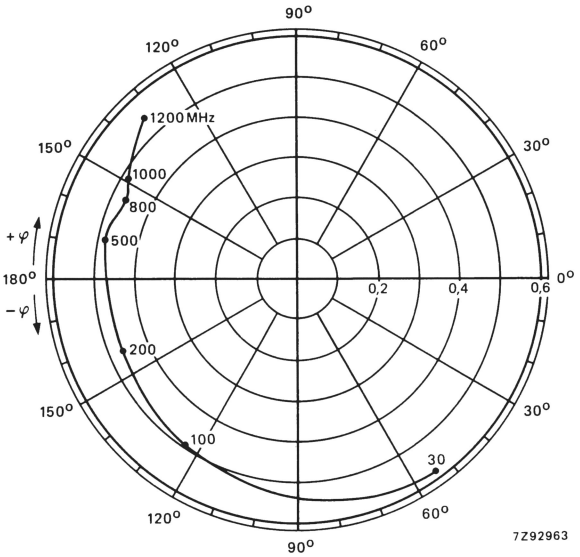


Fig. 16 Input reflection coefficient s_{ie}.

Conditions for Figs 16 and 17:

V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C.

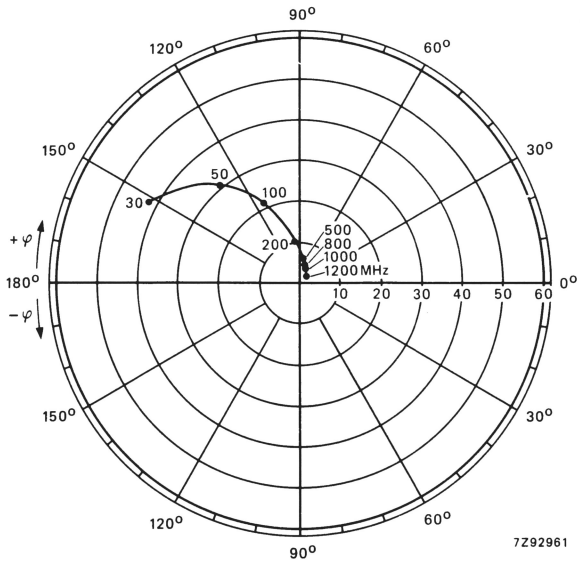


Fig. 17 Forward transmission coefficient s_{fe}.

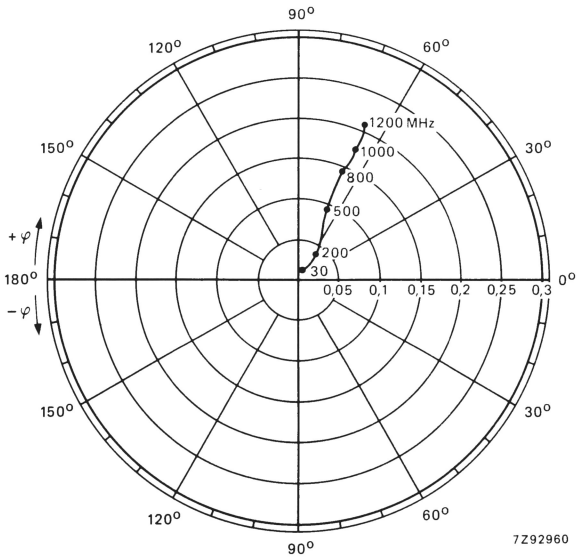


Fig. 18 Reverse transmission coefficient s_{re}.

Conditions for Figs 18 and 19:

V_{CE} = 10 V; I_C = 100 mA; T_{amb} = 25 °C.

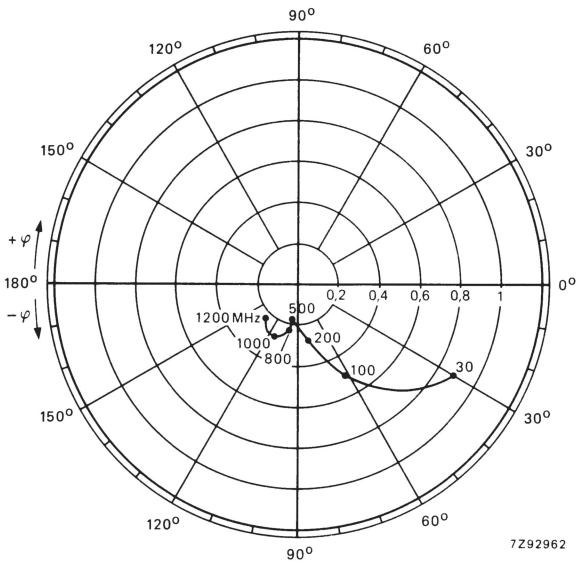


Fig. 19 Output reflection coefficient s_{oe}.

SILICON WIDEBAND TRANSISTOR

P-N-P transistor in a subminiature plastic transfer-moulded T-package. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complements are BFR90 and BFR90A.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15	V
Collector current (d.c.)	$-I_C$	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,45	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7	dB

MECHANICAL DATA (see Fig. 1)

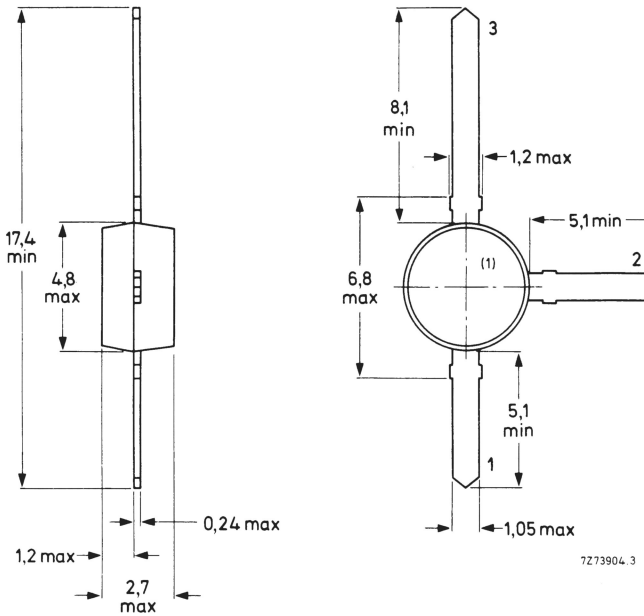
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}	−65 to +150	°C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0,5 K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 10 V	$-I_{CBO}$	<	50	nA
D.C. current gain* $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	h_{FE}	>	20	
Transition frequency at f = 500 MHz* $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; $-V_{CB}$ = 10 V	C_c	typ.	0,65	pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V	C_e	typ.	1,2	pF
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,45	pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7	dB
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	19,0	dB

* Measured under pulse conditions.

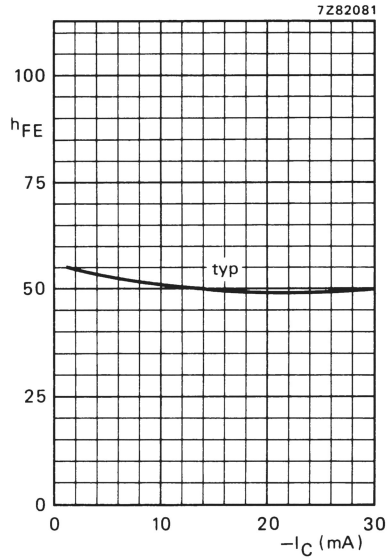


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C.

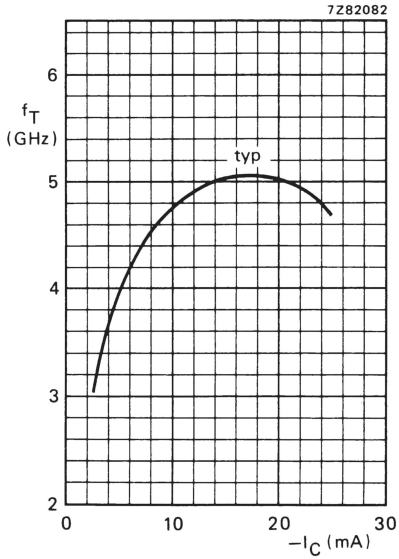


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C.

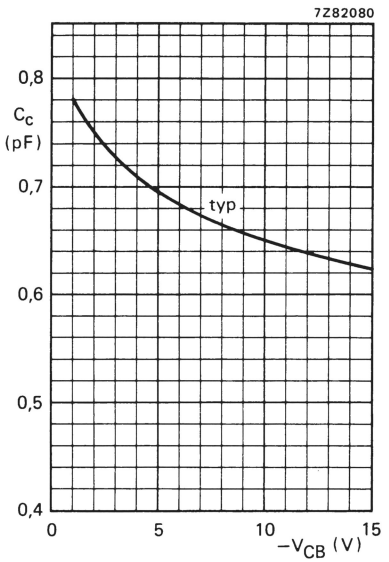


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C.

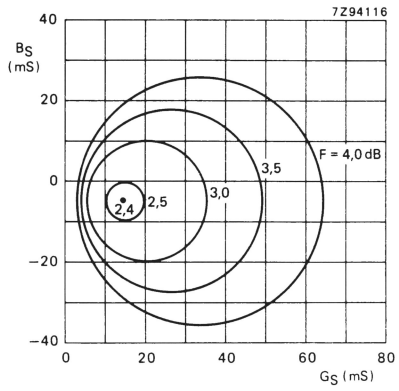


Fig. 5 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 4 mA; f = 800 MHz.

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	G_{UM} dB
2	40	0,81/ 71,2°	6,30/121,7°	0,04/ 40,75°	1,00/ 79,3°	41,1
	100	0,81/ 70,2°	6,40/116,8°	0,04/ 39,88°	0,99/ 64,0°	38,6
	200	0,81/ 71,0°	6,42/123,9°	0,04/ 44,95°	0,99/ 80,2°	39,5
	500	0,81/ 66,5°	6,38/127,8°	0,04/ 42,20°	1,00/ 75,2°	43,7
	800	0,81/ 73,0°	6,37/116,5°	0,04/ 38,38°	0,99/ 76,3°	38,1
	1000	1,02/−179,8°	1,05/ −2,4°	1,03/−2,45°	1,02/ 175,1°	27,2
	1200	0,60/ −67,2°	4,29/128,5°	0,08/ 62,30°	0,80/ −24,1°	19,1
	1500	0,31/−160,2°	2,54/ 83,9°	0,13/ 53,65°	0,68/ −22,1°	11,2
	2000	0,26/ 133,3°	1,26/ 33,4°	0,17/ 50,25°	0,44/ −89,1°	3,3
5	40	0,60/ 66,8°	12,07/129,5°	0,04/ 33,95°	0,98/ 77,1°	38,4
	100	0,59/ 65,3°	12,11/132,3°	0,04/ 40,88°	0,98/ 62,1°	37,3
	200	0,60/ 67,0°	12,12/132,4°	0,04/ 40,45°	0,98/ 78,2°	37,2
	500	0,60/ 62,4°	12,17/135,3°	0,04/ 34,28°	0,98/ 73,4°	37,3
	800	0,60/ 68,4°	12,16/126,6°	0,04/ 45,60°	0,98/ 73,8°	37,5
	1000	1,01/−179,9°	1,07/ −1,4°	1,02/−2,13°	1,07/ 179,0°	27,5
	1200	0,34/ −91,1°	6,49/115,9°	0,06/ 66,53°	0,67/ −28,3°	19,4
	1500	0,19/−172,1°	3,17/ 78,3°	0,12/ 64,63°	0,56/ −18,9°	11,8
	2000	0,31/ 116,7°	1,53/ 33,4°	0,19/ 73,15°	0,37/ −92,1°	4,7
10	40	0,38/ 62,0°	17,24/143,1°	0,04/ 38,65°	0,96/ 74,7°	36,8
	100	0,38/ 60,4°	17,33/140,0°	0,04/ 39,65°	0,96/ 60,2°	36,3
	200	0,38/ 61,7°	17,28/140,8°	0,04/ 41,13°	0,96/ 75,6°	36,2
	500	0,38/ 57,4°	17,26/139,7°	0,04/ 33,58°	0,96/ 71,9°	37,0
	800	0,38/ 63,6°	17,36/139,5°	0,04/ 37,25°	0,96/ 72,2°	36,9
	1000	1,02/ 178,8°	1,15/ −1,4°	1,03/−0,30°	1,14/ 178,2°	20,4
	1200	0,21/−115,5°	7,45/108,5°	0,06/ 72,90°	0,58/ −28,8°	19,4
	1500	0,18/ 167,7°	3,42/ 75,4°	0,13/ 69,90°	0,51/ −19,8°	12,1
	2000	0,22/ 109,4°	1,73/ 32,3°	0,20/ 45,38°	0,34/−123,1°	5,5
14	40	0,27/ 59,0°	19,48/141,0°	0,04/ 38,43°	0,95/ 74,2°	36,1
	100	0,27/ 57,3°	19,51/140,1°	0,04/ 35,55°	0,94/ 59,1°	35,8
	200	0,27/ 59,2°	19,50/142,2°	0,04/ 27,75°	0,95/ 75,1°	36,1
	500	0,28/ 53,7°	19,64/141,0°	0,04/ 33,90°	0,95/ 70,9°	36,4
	800	0,28/ 60,0°	19,36/139,8°	0,04/ 31,23°	0,94/ 71,2°	35,8
	1000	1,01/ 178,9°	1,14/ 2,1°	1,00/−0,93°	1,12/−179,1°	22,8
	1200	0,17/−131,4°	7,71/106,0°	0,05/ 75,85°	0,55/ −28,4°	19,5
	1500	0,18/ 161,1°	3,46/ 74,5°	0,13/ 71,85°	0,49/ −17,0°	12,1
	2000	0,23/ 107,4°	1,99/ 30,8°	0,20/ 44,43°	0,33/−113,2°	6,7

SILICON PLANAR EPITAXIAL TRANSISTOR

Gold-metallized p-n-p transistor in a sub-miniature HERMETICALLY SEALED micro-stripline envelope. It is primarily intended for use in u.h.f. and microwave amplifiers such as aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFP90A.

QUICK REFERENCE DATA

Collector-base voltage	$-V_{CBO}$	max.	20	V
Collector-emitter voltage	$-V_{CEO}$	max.	15	V
Collector current (d.c.)	$-I_C$	max.	30	mA
Total power dissipation up to T_{amb} = 125 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	175	°C
D.C. current gain $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	h_{FE}	min. max.	20 50	
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5	GHz
Maximum unlisted power gain $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; T_{amb} = 25 °C				
at f = 500 MHz	G_{UM}	typ.	21	dB
at f = 800 MHz		typ.	17	dB

MECHANICAL DATA

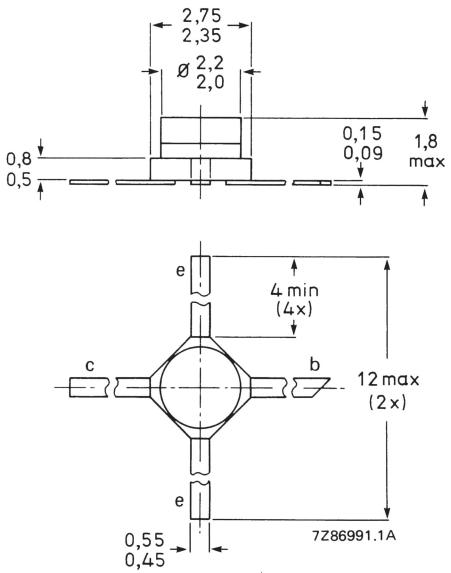
SOT-173 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.

Marking code: C1



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2 V
Collector current (d.c.)	$-I_C$	max.	30 mA
Total power dissipation up to T_{amb} = 125 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		−65 to +150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$	200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
$I_E = 0$; $-V_{CB} = 10$ V	$-I_{CBO}$	max.	50 nA
D.C. current gain			
$-I_C = 14$ mA; $-V_{CE} = 10$ V	h_{FE}	min. typ.	20 50
Transition frequency at f = 500 MHz			
$-I_C = 14$ mA; $-V_{CE} = 10$ V	f_T	typ.	5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $-V_{CB} = 10$ V	C_c	typ.	0,65 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c = 0$; $-V_{EB} = 0{,}5$ V	C_e	typ.	1,1 pF
Feedback capacitance at f = 1 MHz			
$I_C = 0$; $-V_{CE} = 10$ V	C_{re}	typ.	0,45 pF
Maximum unilateral power gain (s_{re} assumed to be zero)			
$G_{UM}\,(\text{dB}) = 10 \log \dfrac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2]\,[1-\lvert s_{oe}\rvert^2]}$			
at $-I_C = 14$ mA; $-V_{CE} = 10$ V			
f = 500 MHz	G_{UM}	typ.	21 dB
f = 800 MHz		typ.	17 dB
Noise figures at f = 800 MHz; R_S = opt.;			
$-I_C = 4$ mA; $V_{CE} = 10$ V	F	typ.	2,5 dB
$-I_C = 14$ mA; $V_{CE} = 10$ V		typ.	3,5 dB

s-parameters (common emitter) at V_{CE} = 10 V; T_{amb} = 25 °C

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,87/ 8,2°	6,4/174,8°	0,011/ 84,6°	0,99/ −3,5°
	100	0,85/ −20,5°	6,3/165,9°	0,026/ 79,1°	0,98/ −8,7°
	200	0,81/ −39,7°	5,9/151,5°	0,050/ 70,1°	0,93/−16,4°
2	500	0,68/ −84,3°	4,4/122,4°	0,094/ 51,5°	0,79/−31,4°
	800	0,59/−112,1°	3,2/103,5°	0,116/ 43,6°	0,70/−38,8°
	1000	0,54/−125,2°	2,7/ 94,6°	0,124/ 41,0°	0,66/−42,3°
	1200	0,52/−137,2°	2,3/ 86,3°	0,133/ 20,0°	0,64/−45,7°
	40	0,72/ −13,1°	12,9/172,0°	0,010/ 82,6°	0,98/ −5,8°
	100	0,69/ −32,2°	12,3/159,6°	0,023/ 74,9°	0,94/−14,1°
	200	0,64/ −60,2°	10,8/141,4°	0,041/ 64,1°	0,84/−24,9°
5	500	0,54/−112,2°	6,7/111,8°	0,070/ 19,5°	0,62/ 39,7°
	800	0,50/−137,3°	4,6/ 95,5°	0,085/ 47,2°	0,53/−44,5°
	1000	0,47/−148,5°	3,7/ 88,1°	0,094/ 46,8°	0,50/−46,2°
	1200	0,46/−158,2°	3,1/ 81,5°	0,103/ 46,6°	0,49/−48,6°
	40	0,55/ −19,4°	19,1/169,1°	0,009/ 80,3°	0,96/ −8,3°
	100	0,53/ −46,6°	17,7/153,6°	0,020/ 71,4°	0,89/−19,4°
	200	0,50/ −82,2°	14,4/133,1°	0,033/ 60,6°	0,74/−31,9°
10	500	0,47/−133,7°	7,8/105,0°	0,054/ 51,9°	0,50/−44,1°
	800	0,46/−153,7°	5,2/ 90,9°	0,069/ 52,8°	0,42/−46,7°
	1000	0,45/ 162,5°	4,2/ 84,6°	0,079/ 53,3°	0,41/−47,4°
	1200	0,46/ 170,3°	3,5/ 78,7°	0,088/ 53,2°	0,39/−49,5°
	40	0,46/ −24,2°	22,3/168,0°	0,008/ 79,0°	0,94/ −9,2°
	100	0,45/ −56,1°	20,1/151,0°	0,019/ 69,9°	0,86/−21,2°
	200	0,45/ −94,5°	15,6/130,6°	0,030/ 59,9°	0,70/−34,0°
14	500	0,47/−142,0°	8,3/102,9°	0,049/ 54,1°	0,46/−44,4°
	800	0,48/−159,2°	5,4/ 89,6°	0,064/ 54,9°	0,39/−46,5°
	1000	0,47/−159,9°	4,4/ 83,9°	0,075/ 55,8°	0,38/−46,2°
	1200	0,47/ 174,6°	3,7/ 78,8°	0,084/ 55,8°	0,37/−47,5°
	40	0,35/ −31,2°	25,1/166,3°	0,007/ 77,6°	0,93/−10,4°
	100	0,38/ −70,2°	22,3/148,0°	0,017/ 68,7°	0,83/−23,7°
	200	0,42/−110,1°	16,8/126,4°	0,027/ 59,8°	0,65/−36,5°
20	500	0,47/−151,9°	8,5/100,4°	0,044/ 56,7°	0,42/−45,4°
	800	0,48/−166,0°	5,5/ 87,3°	0,060/ 58,4°	0,37/−46,6°
	1000	0,48/−173,2°	4,4/ 81,9°	0,070/ 58,8°	0,36/−46,8°
	1200	0,49/−179,4°	3,7/ 76,4°	0,079/ 58,4°	0,35/−48,8°
	40	0,29/ −38,0°	26,4/165,4°	0,007/ 76,2°	0,91/−10,9°
	100	0,35/ −80,7°	23,2/146,6°	0,016/ 67,8°	0,81/−24,7°
	200	0,41/−119,2°	17,1/124,4°	0,025/ 60,1°	0,63/−37,1°
25	500	0,48/−156,2°	8,5/ 99,0°	0,042/ 58,2°	0,41/−44,6°
	800	0,50/−168,8°	5,5/ 86,4°	0,057/ 60,0°	0,36/−45,4°
	1000	0,50/−175,2°	4,4/ 80,9°	0,067/ 60,2°	0,35/−45,5°

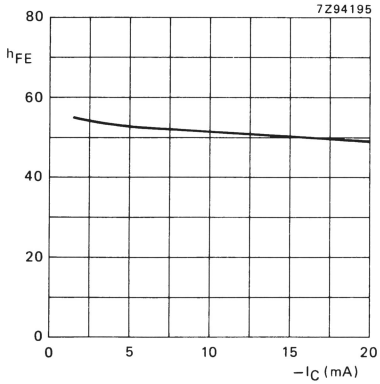


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C.

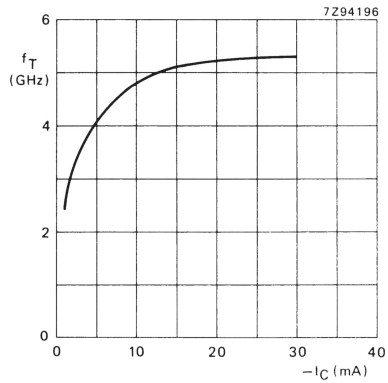


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C.

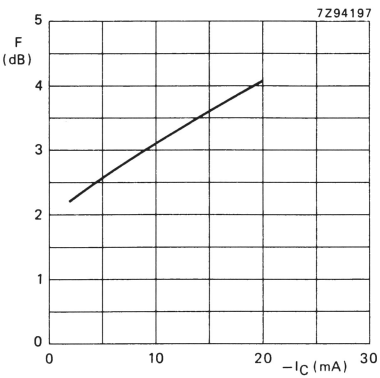


Fig. 4 $-V_{CE}$ = 10 V; f = 800 MHz; T_{amb} = 25 °C; Z_s = optimum.

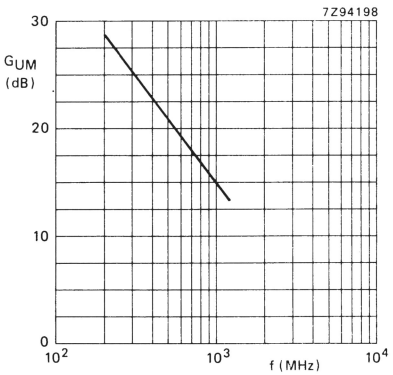


Fig 5 $-V_{CE}$ = 10 V; $-I_C$ = 14 mA; T_{amb} = 25 °C.

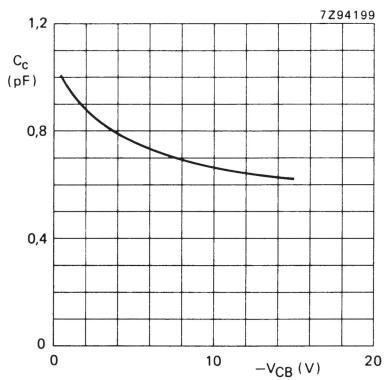


Fig. 6 $-I_E = -I_e$ = 0; f = 1 MHz; T_j = 25 °C.

$-V_{CE}$ = 10 V
$-I_C$ = 14 mA
T_{amb} = 25 °C

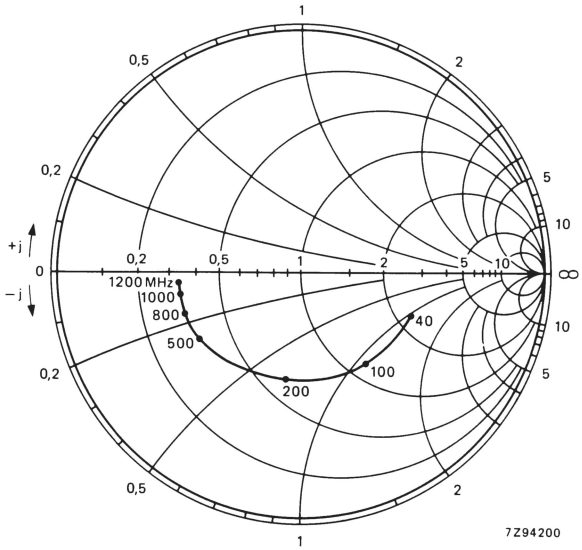


Fig. 7.

Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

$-V_{CE}$ = 10 V
$-I_C$ = 14 mA
T_{amb} = 25 °C

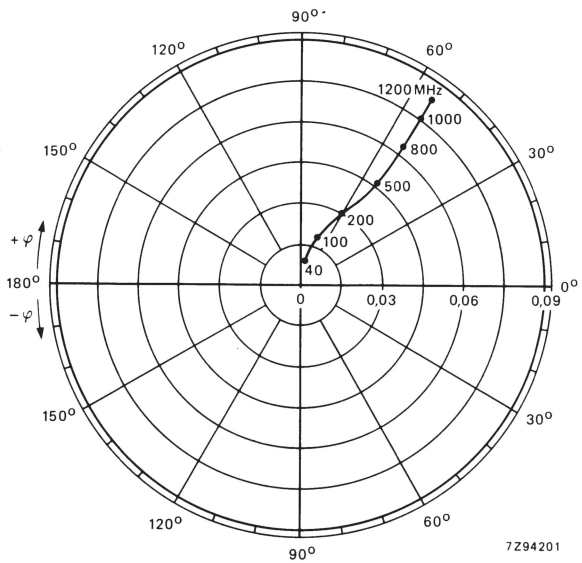


Fig. 8.

Reverse transmission coefficient s_{re}.

$-V_{CE}$ = 10 V
$-I_C$ = 14 mA
T_{amb} = 25 °C

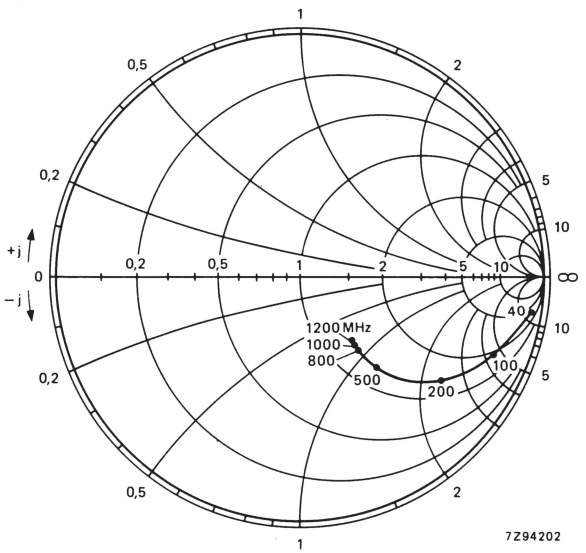


Fig. 9.

Output impedance derived from output reflection coefficient s_{oe} co-ordinates on ohm x 50.

$-V_{CE}$ = 10 V
$-I_C$ = 14 mA
T_{amb} = 25 °C

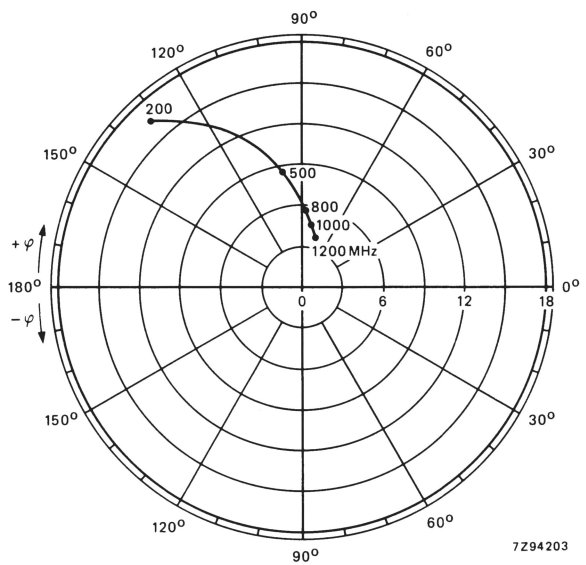


Fig. 10.

Forward transmission coefficient s_{fe}.

SILICON PLANAR EPITAXIAL TRANSISTOR

P-N-P transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

N-P-N complement is BFQ53.

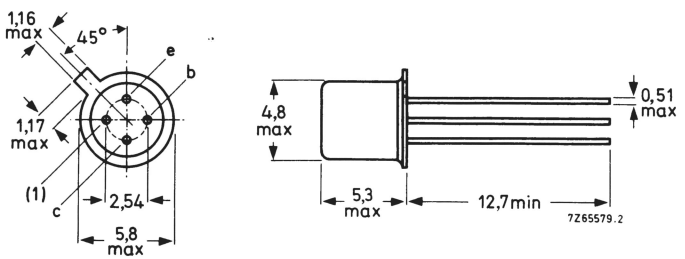
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20 V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15 V
Collector current (d.c.)	$-I_C$	max.	25 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; $-V_{CE}$ = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,5 pF
Noise figure at optimum source impedance $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7 dB
Maximum unilateral power gain $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	$-V_{CBO}$	max.	20	V
Collector-emitter voltage (open base)	$-V_{CEO}$	max.	15	V
Emitter-base voltage (open collector)	$-V_{EBO}$	max.	2	V
Collector current (d.c.)	$-I_C$	max.	25	mA
Collector current (peak value) at f > 1 MHz	$-I_{CM}$	max.	35	mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150	mW
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9	K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6	K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; $-V_{CB}$ = 10 V	$-I_{CBO}$	<	50	nA
D.C. current gain (note 1) $-I_C$ = 14 mA; $-V_{CE}$ = 10 V	h_{FE}	> typ.	20 50	
Transition frequency (notes 1 and 2) $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz	f_T	typ.	5	GHz
Collector capacitance (note 3) $I_E = I_e$ = 0; $-V_{CB}$ = 10 V; f = 1 MHz	C_c	typ.	0,85	pF
Emitter capacitance $I_C = I_c$ = 0; $-V_{EB}$ = 0,5 V; f = 1 MHz	C_e	typ.	1,2	pF
Feedback capacitance (note 2) I_C = 0; $-V_{CE}$ = 10 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,5	pF
Noise figure at optimum source impedance (note 2) $-I_C$ = 2 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,7	dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ $-I_C$ = 14 mA; $-V_{CE}$ = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17,0	dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

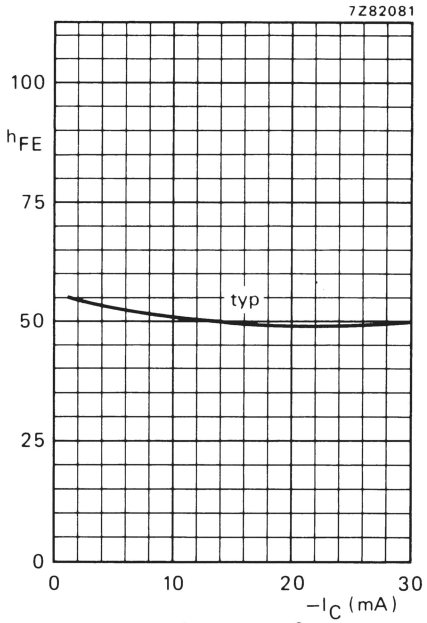


Fig. 2 $-V_{CE}$ = 10 V; T_j = 25 °C.

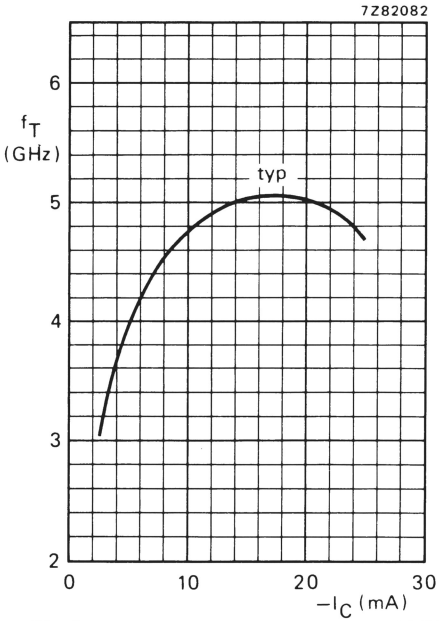


Fig. 3 $-V_{CE}$ = 10 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

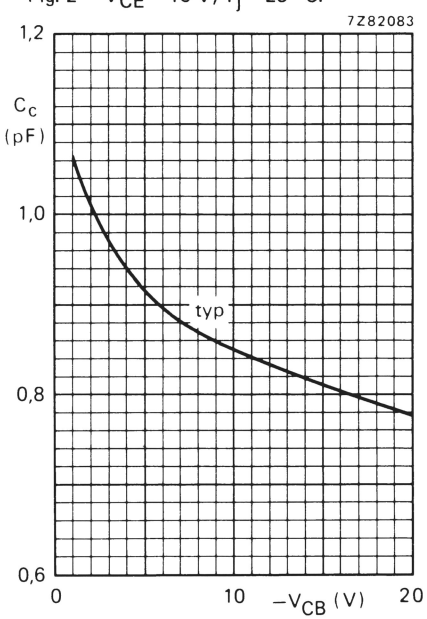


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features extremely high power gain coupled with good low noise performance.

P-N-P complement is BFQ52.

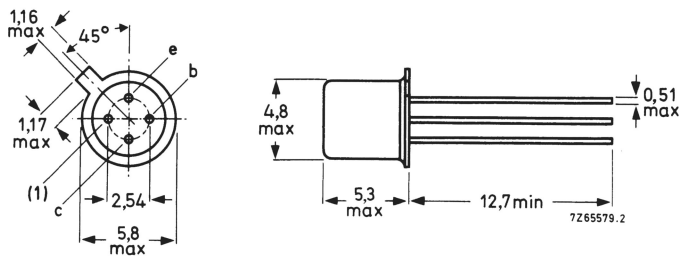
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Maximum unilateral power gain I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18,0 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	35 mA
Total power dissipation up to T_{amb} = 65 °C	P_{tot}	max.	150 mW
Storage temperature	T_{stg}		−65 to +200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0,9 K/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0,6 K/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50 nA
D.C. current gain (note 1) I_C = 14 mA; V_{CE} = 10 V	h_{FE}	> typ.	25 50
Transition frequency (notes 1 and 2) I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	f_T	typ.	5 GHz
Collector capacitance (note 3) $I_E = I_e$ = 0; V_{CB} = 10 V; f = 1 MHz	C_c	typ.	0,75 pF
Emitter capacitance $I_C = I_c$ = 0; V_{EB} = 0,5 V; f = 1 MHz	C_e	typ.	1,2 pF
Feedback capacitance (note 2) I_C = 0; V_{CE} = 10 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ.	0,45 pF
Noise figure at optimum source impedance (note 2) I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero G_{UM} (in dB) = $\frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$ I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18,0 dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead not connected.

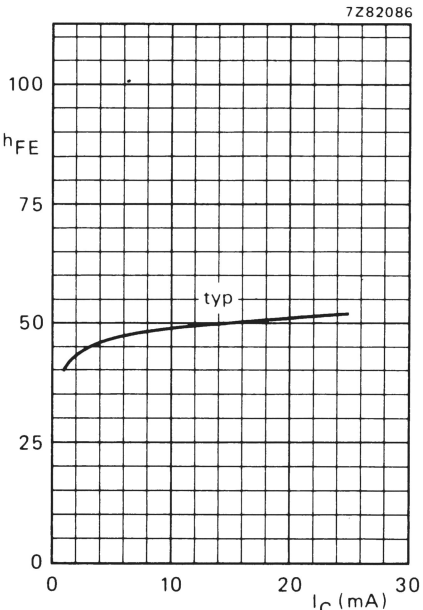


Fig. 2 V_{CE} = 10 V; T_j = 25 °C.

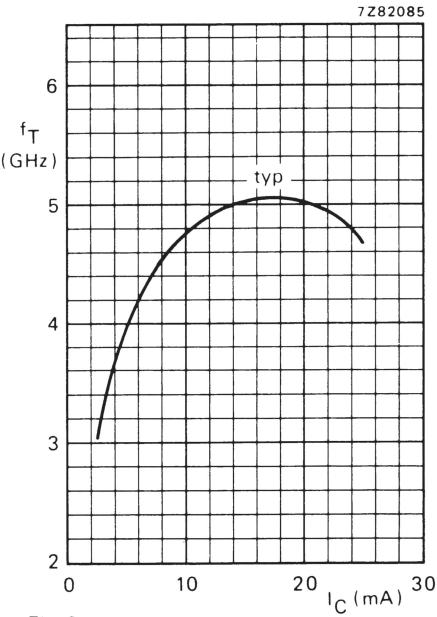


Fig. 3 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

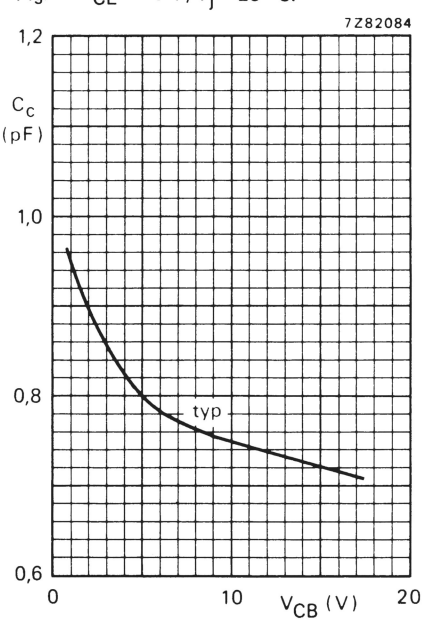


Fig. 4 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C; shield lead not connected.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.

The transistor features the combination of high power gain, high transition frequency and low noise up to high frequencies.

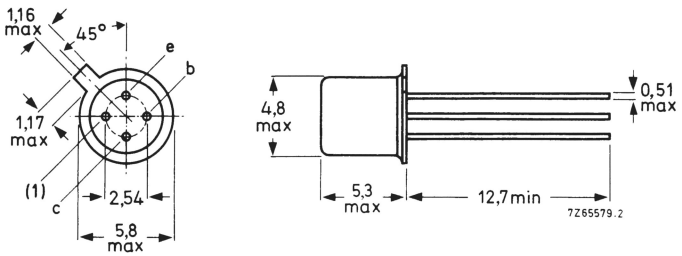
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	75 mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	250 mW
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	4,5 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1,0 pF
Noise figure at optimum source impedance I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	F	<	3,0 dB
Maximum unilateral power gain I_C = 20 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	>	17,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72 with insulated electrodes.



(1) shield lead connected to case.

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	75 mA
Collector current (peak value) at f > 1 MHz	I_{CM}	max.	150 mA
Total power dissipation up to T_{amb} = 50 °C	P_{tot}	max.	250 mW
Storage temperature	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	600 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	350 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	<	100 nA
D.C. current gain (note 1) I_C = 20 mA; V_{CE} = 5 V	h_{FE}	> <	50 150
Transistion frequency (notes 1 and 2) I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	4,5 GHz
Collector capacitance (note 3) I_C = 0; V_{CB} = 5 V; f = 1 MHz	C_{cb}	typ.	1,3 pF
Feedback capacitance (note 2) I_C = 0; V_{CE} = 10 V; f = 1 MHz; T_{amb} = 25 °C	C_{re}	typ. <	1,0 pF 1,4 pF
Noise figure at optimum source impedance (note 2) I_C = 10 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	F	<	3,0 dB
I_C = 10 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,3 dB
Maximum unilateral power gain (note 2) s_{re} assumed to be zero $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)(1-\lvert s_{oe}\rvert^2)}$			
I_C = 20 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	>	17,5 dB
I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5 dB

Notes
1. Measured under pulse conditions.
2. Shield lead grounded.
3. Shield lead and emitter lead connected to bridge earth.

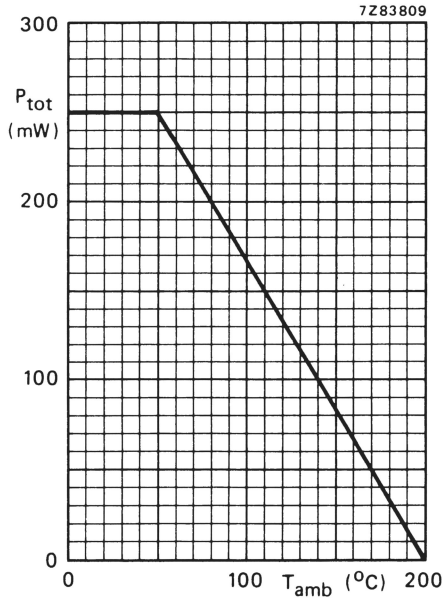


Fig. 2 Maximum permissible power dissipation in free air as a function of ambient temperature.

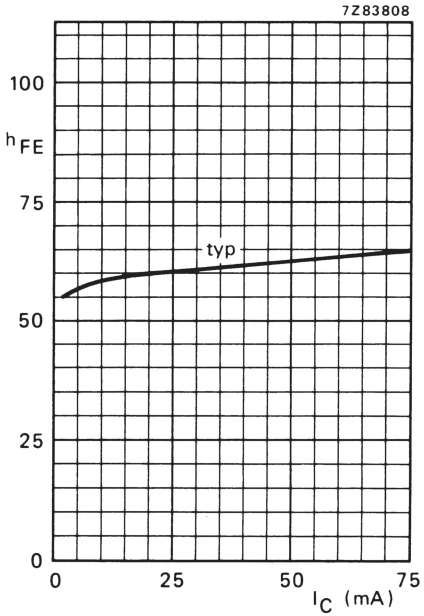


Fig. 3 V_{CE} = 5 V; T_j = 25 °C.

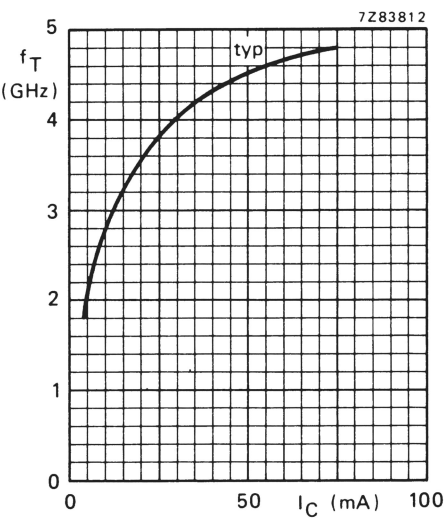


Fig. 4 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C; shield lead grounded.

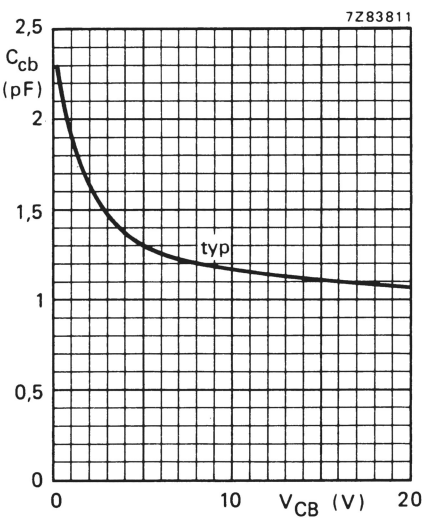


Fig. 5 I_C = 0; f = 1 MHz; T_j = 25 °C; shield lead and emitter lead connected to bridge earth.

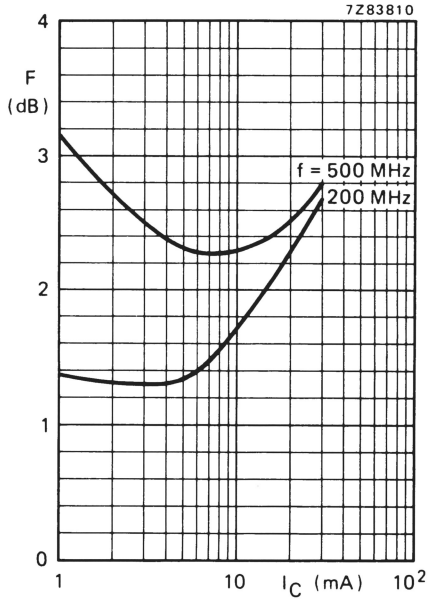


Fig. 6 V_{CE} = 5 V; Z_S = optimum; T_{amb} = 25 °C; typical values.

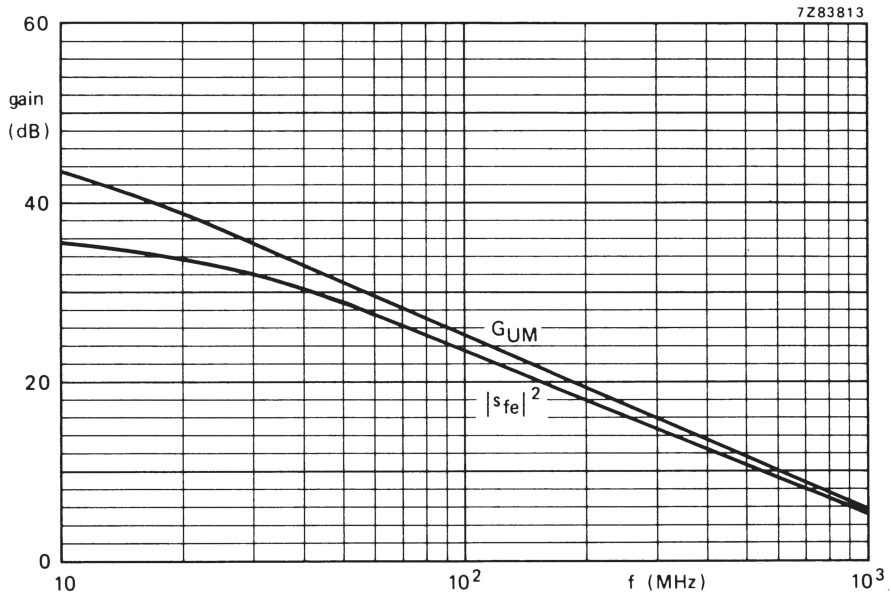


Fig. 7 V_{CE} = 5 V; I_C = 50 mA; T_{amb} = 25 °C; typical values.

N-P-N MICROWAVE TRANSISTOR

Small-signal planar epitaxial n-p-n transistor in plastic SOT-37 envelope and featuring a very high transition frequency and a very low noise figure up to high frequencies.

This device is designed for use in the GHz range.

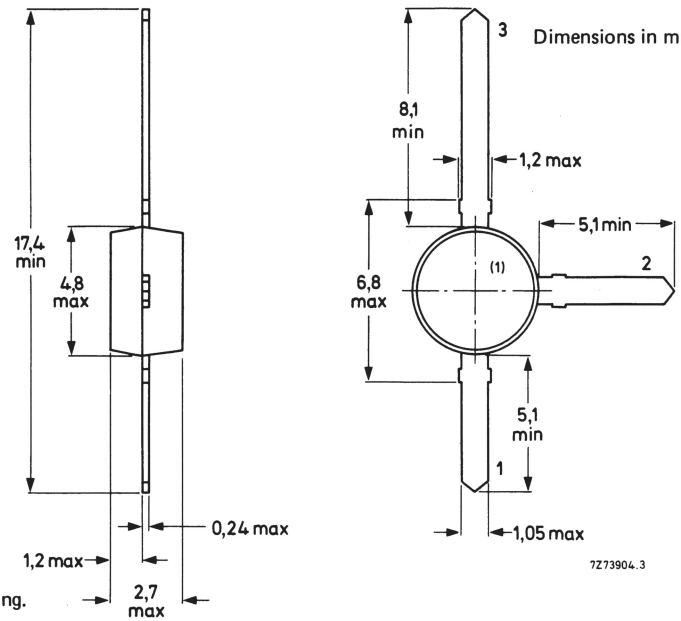
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	10	V
Collector current (d.c.)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100	
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C	G_{UM}	typ.	8,0	dB

MECHANICAL DATA

Fig. 1 SOT-37.

Dimensions in mm



Connections:

1. Base
2. Emitter
3. Collector

(1) Type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 60 °C mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	P_{tot}	max.	300 mW
Storage temperature	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$		300 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	max.	50 nA
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 8 V	C_c	typ.	0,8 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,3 pF
Feedback capacitance I_C = 0; V_{CE} = 8 V	C_{re}	typ.	0,5 pF
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = 10 log $\dfrac{\lvert s_{fe}\rvert^2}{[1-\lvert s_{ie}\rvert^2][1-\lvert s_{oe}\rvert^2]}$ I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	8,0 dB
Noise figure at f = 2 GHz; R_S = 60 Ω; T_{amb} = 25 °C I_C = 5 mA; V_{CE} = 8 V I_C = 15 mA; V_{CE} = 8 V	F F	typ. typ.	2,5 dB 3,0 dB

s-parameters (common emitter) at V_{CE} = 8 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}	GUM dB
	40	0,87/ −12,9°	15,83/171,2°	0,01/82,0°	0,98/ −6,5°	45,3
	100	0,81/ −31,0°	14,92/155,8°	0,02/74,8°	0,93/−15,7°	37,1
	200	0,69/ −54,6°	12,40/138,3°	0,04/67,0°	0,83/−25,9°	29,8
5	500	0,42/−105,7°	7,12/104,9°	0,07/59,1°	0,59/−40,4°	19,7
	800	0,34/−128,7°	4,89/ 91,3°	0,10/63,0°	0,58/−49,1°	16,1
	1000	0,35/−142,8°	4,13/ 83,2°	0,12/63,7°	0,58/−58,0°	14,6
	2000	0,25/ 128,0°	2,08/ 56,8°	0,20/67,8°	0,38/−63,3°	7,3
	40	0,75/ −19,1°	26,88/165,6°	0,01/80,0°	0,96/−10,2°	43,8
	100	0,65/ −43,3°	23,08/144,9°	0,02/71,7°	0,86/−22,1°	35,5
	200	0,49/ −70,7°	16,71/125,2°	0,03/66,4°	0,70/−31,6°	28,6
10	500	0,28/−126,5°	8,21/ 96,9°	0,06/66,4°	0,48/−40,0°	19,8
	800	0,24/−136,7°	5,39/ 86,8°	0,10/70,8°	0,50/−48,9°	16,1
	1000	0,26/−147,8°	4,49/ 79,9°	0,12/70,5°	0,51/−58,9°	14,6
	2000	0,22/ 114,8°	2,28/ 56,5°	0,21/68,8°	0,32/−61,8°	7,8
	40	0,67/ −23,8°	34,23/161,4°	0,01/78,3°	0,94/−12,6°	42,9
	100	0,54/ −51,8°	27,41/138,1°	0,02/71,0°	0,80/−25,5°	34,7
	200	0,39/ −80,0°	18,52/118,7°	0,03/68,4°	0,63/−33,2°	28,2
15	500	0,22/−130,3°	8,47/ 93,5°	0,06/70,2°	0,44/−38,8°	19,7
	800	0,20/−140,8°	5,57/ 84,9°	0,10/73,6°	0,47/−48,4°	16,2
	1000	0,22/ 147,5°	4,64/ 78,4°	0,12/72,9°	0,48/−59,0°	14,7
	2000	0,21/ 109,8°	2,34/ 56,2°	0,22/68,7°	0,31/−61,0°	8,0
	40	0,61/ −27,4°	39,76/158,4°	0,01/76,8°	0,92/−14,2°	42,4
	100	0,47/ −58,0°	30,05/133,7°	0,02/70,4°	0,75/−27,5°	34,2
	200	0,32/ −86,2°	19,38/114,7°	0,03/70,4°	0,58/−33,5°	28,0
20	500	0,19/−136,8°	8,65/ 92,0°	0,06/72,4°	0,41/−37,5°	19,7
	800	0,18/−145,1°	5,62/ 83,5°	0,10/75,3°	0,46/−47,9°	16,1
	1000	0,20/−151,9°	4,63/ 77,7°	0,12/74,1°	0,47/−58,8°	14,6
	2000	0,21/−107,3°	2,37/ 55,7°	0,22/69,0°	0,30/−60,6°	8,1
	40	0,51/ −33,2°	46,18/154,6°	0,01/75,6°	0,89/−16,4°	41,4
	100	0,37/ −67,3°	32,56/128,1°	0,02/70,6°	0,69/−29,1°	33,7
	200	0,26/ −97,3°	20,04/110,7°	0,03/72,3°	0,53/−32,7°	27,8
30	500	0,17/−151,6°	8,64/ 89,7°	0,06/74,6°	0,39/−35,6°	19,6
	800	0,16/−152,2°	5,61/ 82,1°	0,10/76,7°	0,44/−46,9°	16,0
	1000	0,19/−157,7°	4,62/ 76,4°	0,12/75,1°	0,46/−58,3°	14,5
	2000	0,22/ 106,4°	2,37/ 55,0°	0,23/69,3°	0,29/−60,0°	8,1

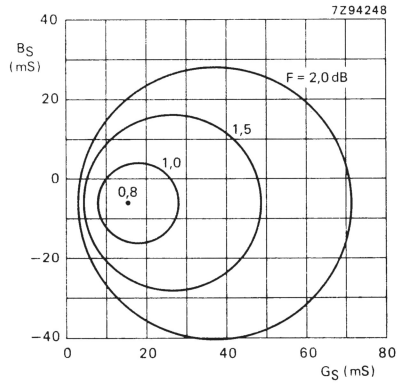


Fig. 2 Circles of constant noise figure; V_{CE} = 8 V; I_C = 5 mA; f = 800 MHz.

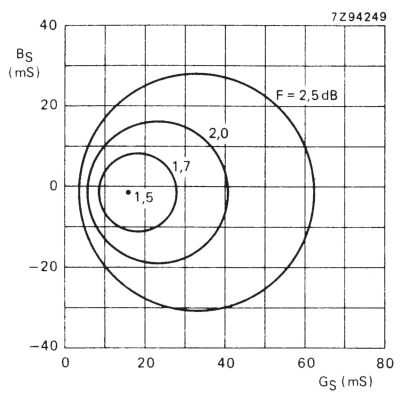


Fig. 3 Circles of constant noise figure; V_{CE} = 8 V; I_C = 15 mA; f = 800 MHz.

N-P-N 2 GHz BROADBAND TRANSISTOR

Small-signal planar epitaxial n-p-n transistor in HERMETICALLY SEALED microstripline envelope and designed for broadband amplifiers up to 2 GHz, and application in the 2 GHz range.

Features:

- hermetically sealed envelope
- gold-metallized crystals
- very high transition frequency and very low noise in the GHz range

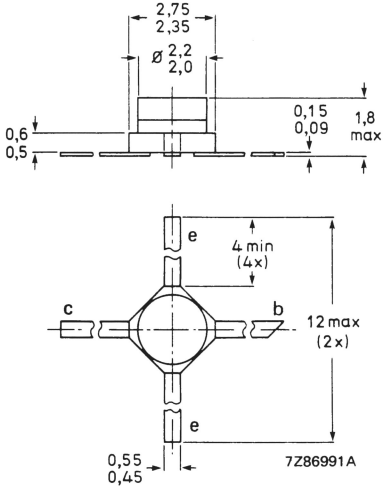
QUICK REFERENCE DATA

Collector-base voltage	V_{CBO}	max.	20	V
Collector-emitter voltage	V_{CEO}	max.	10	V
Collector current (d.c.)	I_C	max.	50	mA
Total power dissipation up to T_{amb} = 105 °C	P_{tot}	max.	350	mW
Junction temperature	T_j	max.	175	°C
D.C. current gain I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100	
Transition frequency at f = 500 MHz I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5	GHz
Maximum unilateral power gain at f = 2 GHz I_C = 15 mA; V_{CE} = 8 V; T_{amb} = 25 °C	G_{UM}	typ.	11,5	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-173.



Marking code: Q6

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	10 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 105 °C mounted on a ceramic substrate of 0,7 mm x 10 cm²	P_{tot}	max.	350 mW
Storage temperature	T_{stg}		−65 to + 150 °C
Junction temperature	T_j	max.	175 °C

THERMAL RESISTANCE

From junction to ambient mounted on a ceramic substrate of 0,7 mm x 10 cm²	$R_{th\ j\text{-}a}$		200 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 5 V	I_{CBO}	max.	50 nA
D.C. current gain* I_C = 15 mA; V_{CE} = 5 V	h_{FE}	min. typ.	60 100
Transition frequency at f = 500 MHz* I_C = 15 mA; V_{CE} = 8 V	f_T	typ.	7,5 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 8 V	C_c	typ.	0,7 pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,3 pF
Feedback capacitance I_C = 0; V_{CE} = 8 V	C_{re}	typ.	0,4 pF
Maximum unilateral power gain (s_{re} assumed to be ZERO) $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe} \rvert^2}{[1 - \lvert s_{ie} \rvert^2][1 - \lvert s_{oe} \rvert^2]}$ I_C = 15 mA; V_{CE} = 8 V; f = 2 GHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5 dB
Noise figure at f = 2 GHz; R_S = 60 Ω; T_{amb} = 25 °C I_C = 5 mA; V_{CE} = 8 V	F	typ.	2,5 dB
I_C = 15 mA; V_{CE} = 8 V	F	typ. max.	3,0 dB 4,0 dB

* Measured under pulse conditions.

s-parameters (common emitter) at V_{CB} = 7 V and I_E = 5 mA and 15 mA resp.

I_E	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	100	0,86/– 30,0°	15,8/160,5°	0,024/74,1°	0,97/– 16,1°
	200	0,79/– 56,5°	14,0/143,8°	0,043/62,5°	0,87/– 28,2°
	300	0,73/– 77,9°	11,8/130,6°	0,056/53,6°	0,76/– 37,0°
	400	0,68/– 95,3°	10,1/121,2°	0,064/48,0°	0,67/– 43,6°
	500	0,66/–108,1°	8,7/114,1°	0,070/44,8°	0,62/– 48,0°
	600	0,63/–119,0°	7,7/107,9°	0,074/42,7°	0,57/– 50,6°
	700	0,62/–127,8°	6,7/103,2°	0,079/41,6°	0,53/– 52,6°
	800	0,59/–135,8°	6,1/ 99,2°	0,081/40,8°	0,50/– 54,8°
5 mA	900	0,58/–141,0°	5,5/ 95,5°	0,084/40,8°	0,49/– 55,5°
	1000	0,57/–147,4°	5,0/ 92,0°	0,087/40,7°	0,46/– 56,5°
	1200	0,56/–157,0°	4,2/ 85,9°	0,092/41,2°	0,44/– 59,5°
	1500	0,53/–168,7°	3,4/ 77,5°	0,092/37,7°	0,44/– 60,6°
	2000	0,54/+ 171,9°	2,6/ 65,8°	0,103/40,6°	0,41/– 66,5°
	2500	0,54/+ 158,8°	2,2/ 57,8°	0,114/44,6°	0,39/– 75,2°
	3000	0,53/+ 144,8°	1,8/ 49,2°	0,129/48,1°	0,39/– 83,1°
	3500	0,55/+ 134,0°	1,6/ 41,9°	0,148/50,4°	0,37/– 96,2°
	4000	0,54/+ 120,2°	1,5/ 32,1°	0,170/49,9°	0,37/–109,0°

I_E	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	100	0,68/– 54,8°	31,3/147,5°	0,020/65,8°	0,86/– 28,0°
	200	0,61/– 92,4°	23,3/126,6°	0,031/54,6°	0,67/– 43,8°
	300	0,57/–115,8°	17,5/114,4°	0,038/49,8°	0,52/– 51,5°
	400	0,55/–131,0°	13,9/106,8°	0,042/48,7°	0,44/– 56,5°
	500	0,55/–141,0°	11,5/101,6°	0,046/49,3°	0,40/– 59,3°
	600	0,53/–149,3°	9,8/ 96,7°	0,051/50,4°	0,36/– 60,2°
	700	0,54/–155,5°	8,5/ 93,3°	0,055/51,6°	0,34/– 61,2°
	800	0,54/–160,6°	7,5/ 90,4°	0,058/52,9°	0,32/– 62,4°
15 mA	900	0,52/–164,6°	6,7/ 87,8°	0,063/54,1°	0,31/– 62,3°
	1000	0,52/–169,1°	6,1/ 85,4°	0,067/55,1°	0,30/– 62,6°
	1200	0,51/–176,1°	5,1/ 80,3°	0,075/56,5°	0,28/– 64,7°
	1500	0,50/+ 171,5°	4,2/ 73,5°	0,081/55,8°	0,28/– 66,6°
	2000	0,52/+ 157,8°	3,2/ 63,8°	0,100/57,3°	0,26/– 68,2°
	2500	0,52/+ 148,1°	2,6/ 57,2°	0,120/58,6°	0,25/– 75,5°
	3000	0,51/+ 135,6°	2,2/ 49,1°	0,143/58,2°	0,25/– 81,8°
	3500	0,54/+ 127,6°	2,0/ 42,1°	0,167/57,5°	0,24/– 96,0°
	4000	0,52/+ 114,6°	1,8/ 33,4°	0,191/54,3°	0,24/–110,9°

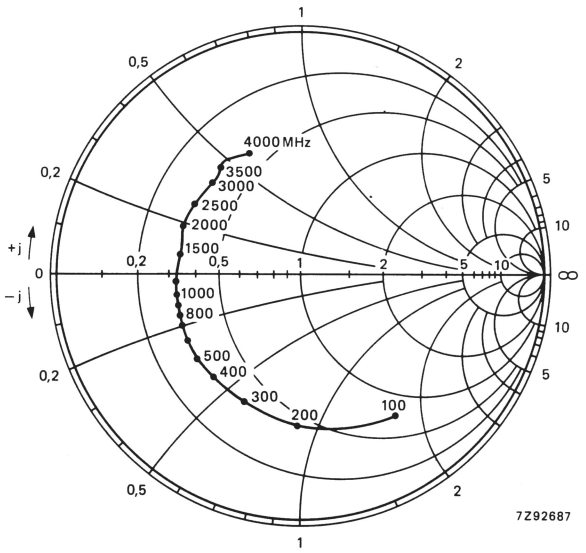


Fig. 2 Input impedance, derived from input reflection coefficient s_{ie} coordinates, in Ω x 50.

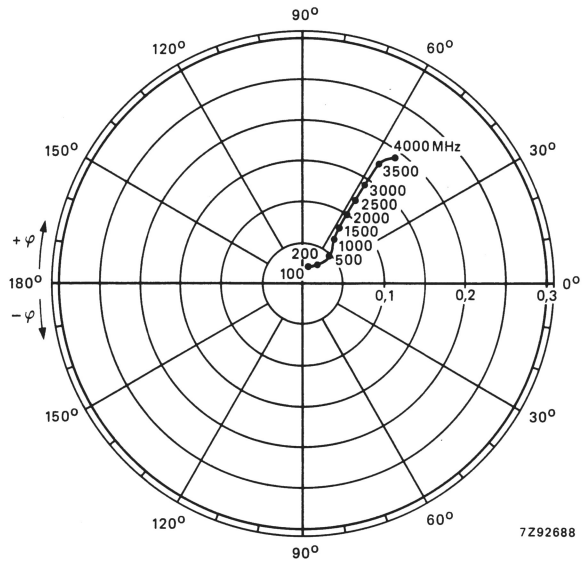


Fig. 3 Reverse transmission coefficient s_{re}.

Conditions for Figs 2 to 5: V_{CB} = 7 V; I_C = 15 mA; T_{amb} = 25 °C.

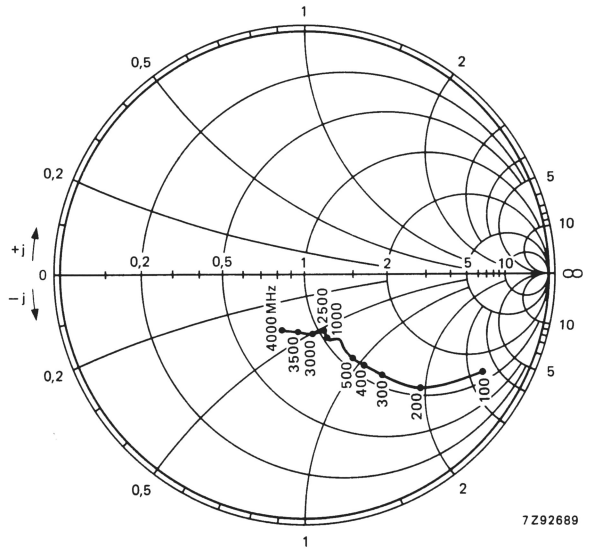


Fig. 4 Output impedance, derived from output reflection coefficient s_{oe} coordinates, in Ω x 50.

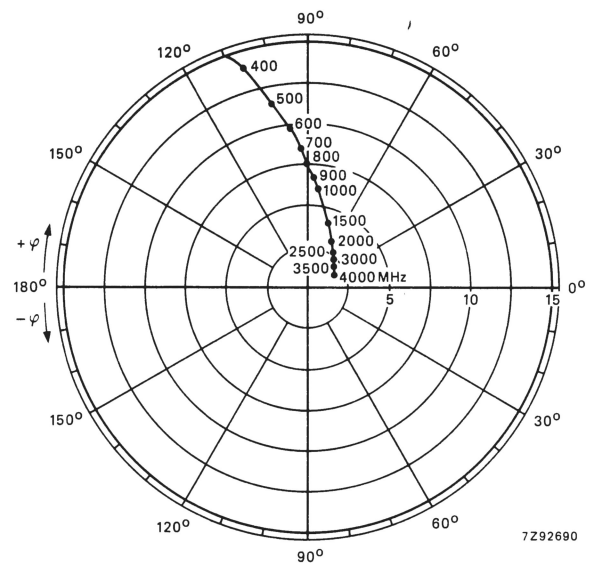


Fig. 5 Forward transmission coefficient s_{fe}.

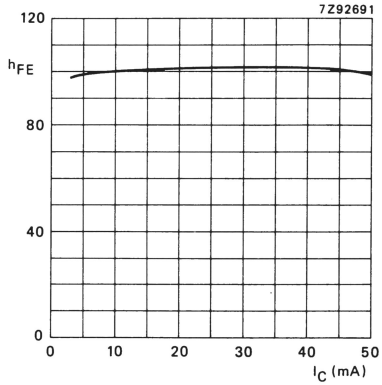


Fig. 6 V_{CE} = 5 V; T_j = 25 °C; typ. values.

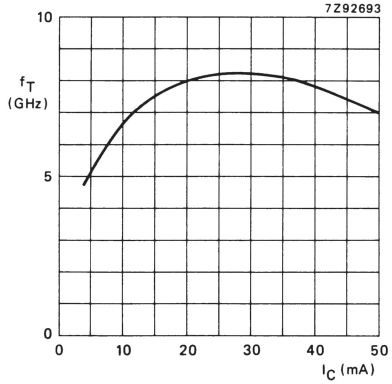


Fig. 7 V_{CE} = 8 V; f = 500 MHz; T_j = 25 °C; typ. values.

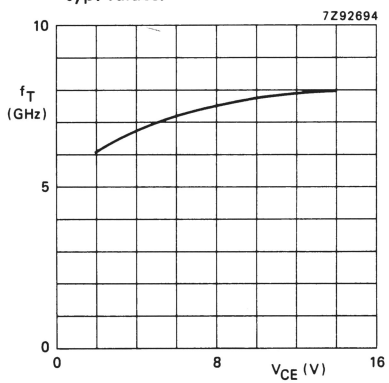


Fig. 8 I_C = 15 mA; f = 500 MHz; T_j = 25 °C; typ. values.

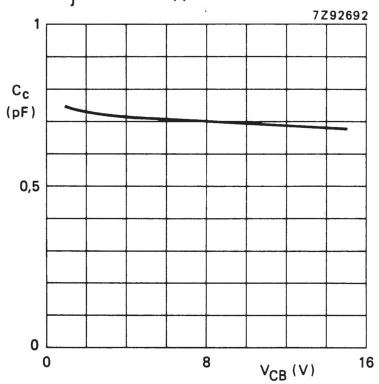


Fig. 9 $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C; typ. values.

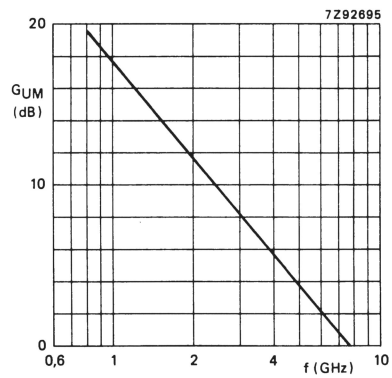


Fig. 10 V_{CB} = 7 V; I_C = 15 mA; T_j = 25 °C; typ. values.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor primarily intended for final stages in MATV system amplifiers. This device is also suitable for use in low power band IV and V equipment. Diffused emitter ballasting resistors and the application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Collector current (d.c.)	I_C	max.	300	mA
Total power dissipation up to T_{mb} = 110 °C	P_{tot}	max.	4,5	W
Operating junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4	GHz
Output voltage at d_{im} = −60 dB (see Figs 2 and 12) I_C = 240 mA; V_{CE} = 15 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	1,6	V
Output power at 1 dB gain compression	P_{L1}	typ.	+28	dBm
Third order intercept point	ITO	typ.	+47	dBm

MECHANICAL DATA

SOT-122 (see Fig. 1).

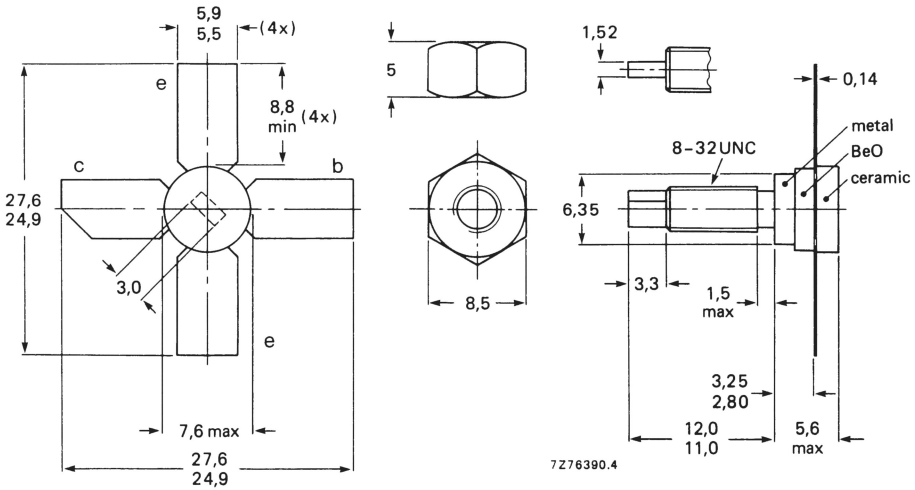
PRODUCT SAFETY

This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Collector current (d.c.)	I_C	max.	300	mA
Total power dissipation up to T_{mb} = 110 °C (see Fig. 7)	P_{tot}	max.	4,5	W
Storage temperature	T_{stg}	−65 to	+150	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	20,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_{amb} = 25 °C

Collector cut-off current I_E = 0; V_{CB} = 15 V	I_{CBO}	<	50 μA
D.C. current gain* I_C = 240 mA; V_{CE} = 15 V	h_{FE}	>	25
Transition frequency at f = 500 MHz* I_C = 240 mA; V_{CE} = 15 V	f_T	typ.	4 GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ.	3,8 pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	20 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 15 V	C_{re}	typ.	2,3 pF
Collector-stud capacitance**	C_{cs}	typ.	0,8 pF
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$ I_C = 240 mA; V_{CE} = 15 V; f = 800 MHz	G_{UM}	typ.	13 dB
Output voltage at d_{im} = −60 dB (see Figs 2 and 12) (DIN 45004B, par. 6.3: 3-tone) I_C = 240 mA; V_{CE} = 15 V; R_L = 75 Ω $V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz $V_q = V_o$ −6 dB ; f_q = 803,25 MHz $V_r = V_o$ −6 dB ; f_r = 805,25 MHz measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	1,6 V

* Measured under pulse conditions.

** Measured with emitter and base grounded.

→ Output power at 1 dB gain compression (see Fig. 2)
I_C = 240 mA; V_{CE} = 15 V
R_L = 75 Ω;
measured at f = 800 MHz

P_{L1} typ. +28 dBm

→ Third order intercept point (see Fig. 2)
I_C = 240 mA; V_{CE} = 15 V
R_L = 75 Ω;
P_p = ITO − 6 dB; f_p = 800 MHz
P_q = ITO − 6 dB; f_q = 801 MHz
measured at $f_{(2q-p)}$ = 802 MHz and
at $f_{(2p-q)}$ = 799 MHz

ITO typ. +47 dBm

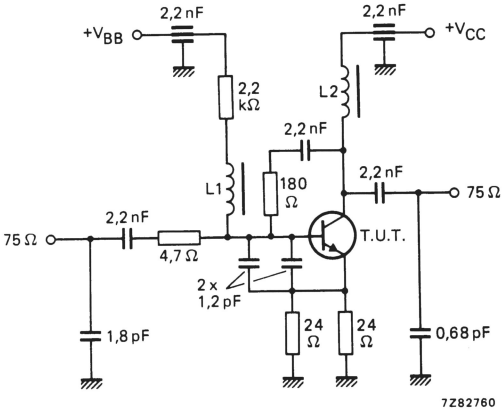


Fig. 2 Intermodulation distortion MATV test circuit. Power gain at f = 40 MHz to 860 MHz is typical 7 dB.

L1 = L2 = 5 μH micro choke.

s-parameters (common emitter) at V_{CE} = 7,5 V.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
	40	0,66/−135,7°	0,02/41,1°	30,4/124,0°	0,64/ −79,0°
	100	0,77/−164,0°	0,03/33,6°	14,8/101,2°	0,45/−125,3°
	200	0,80/−176,3°	0,03/44,1°	7,7/ 89,1°	0,39/−147,9°
50	500	0,80/ 170,2°	0,06/55,3°	3,1/ 70,3°	0,38/−159,5°
	800	0,78/ 157,0°	0,09/60,5°	2,0/ 57,2°	0,42/−165,6°
	1000	0,78/ 152,4°	0,11/61,8°	1,6/ 48,1°	0,43/−167,6°
	1200	0,75/ 142,7°	0,13/59,9°	1,4/ 41,1°	0,46/−171,2°
	40	0,67/−146,1°	0,02/40,9°	33,5/121,5°	0,64/ −90,4°
	100	0,78/−167,5°	0,02/37,2°	15,6/100,4°	0,49/−134,4°
	200	0,80/−178,3°	0,03/47,0°	8,1/ 89,2°	0,45/−155,5°
100	500	0,79/ 168,9°	0,06/60,4°	3,4/ 72,0°	0,43/−170,5°
	800	0,77/ 156,1°	0,09/62,0°	2,2/ 59,5°	0,44/−174,5°
	1000	0,77/ 151,5°	0,11/61,9°	1,8/ 51,5°	0,44/−178,5°
	1200	0,74/ 141,8°	0,14/59,4°	1,5/ 44,0°	0,46/−178,5°
	40	0,68/−149,0°	0,02/40,8°	34,3/120,6°	0,64/ −94,6°
	100	0,78/−168,8°	0,02/38,8°	15,9/100,0°	0,50/−138,0°
	200	0,80/−179,0°	0,03/49,0°	8,2/ 89,2°	0,47/−158,2°
150	500	0,79/ 168,5°	0,06/61,6°	3,4/ 72,5°	0,45/−173,2°
	800	0,77/ 155,8°	0,09/62,5°	2,2/ 60,3°	0,46/−177,1°
	1000	0,76/ 151,2°	0,12/62,1°	1,8/ 52,5°	0,46/ 177,1°
	1200	0,73/ 141,6°	0,14/59,1°	1,5/ 45,1°	0,47/ 177,1°
	40	0,68/−150,7°	0,02/40,5°	34,7/120,0°	0,64/ −97,3°
	100	0,78/−169,7°	0,02/39,6°	15,9/ 99,7°	0,51/−140,4°
	200	0,80/−179,8°	0,03/50,1°	8,2/ 89,0°	0,49/−159,8°
200	500	0,79/ 168,2°	0,06/62,1°	3,4/ 72,6°	0,47/−174,8°
	800	0,77/ 155,6°	0,09/62,6°	2,2/ 60,5°	0,47/−178,6°
	1000	0,76/ 150,9°	0,12/62,1°	1,8/ 52,9°	0,46/ 175,5°
	1200	0,73/ 141,4°	0,14/59,0°	1,5/ 45,3°	0,47/ 174,6°
	40	0,69/−151,9°	0,02/40,1°	34,6/119,4°	0,63/ −99,4°
	100	0,79/−170,3°	0,02/39,9°	15,8/ 99,5°	0,52/−141,8°
	200	0,80/ 180,0°	0,03/51,0°	8,1/ 88,9°	0,49/−160,9°
250	500	0,80/ 168,0°	0,06/62,5°	3,4/ 72,6°	0,47/−175,6°
	800	0,78/ 155,4°	0,09/62,8°	2,2/ 60,6°	0,48/−179,5°
	1000	0,77/ 150,8°	0,12/62,1°	1,8/ 53,0°	0,47/ 174,5°
	1200	0,73/ 141,3°	0,14/58,9°	1,5/ 45,6°	0,47/ 173,9°
	40	0,69/−152,9°	0,02/39,7°	34,4/118,9°	0,62/−101,2°
	100	0,79/−170,8°	0,02/40,1°	15,5/ 99,2°	0,52/−143,2°
	200	0,80/ 179,6°	0,03/51,5°	8,0/ 88,8°	0,50/−161,7°
300	500	0,80/ 167,9°	0,06/62,8°	3,4/ 72,5°	0,48/−176,2°
	800	0,78/ 155,3°	0,09/62,9°	2,2/ 60,5°	0,48/+ 179,8°
	1000	0,77/ 150,6°	0,12/62,1°	1,8/ 53,0°	0,47/ 173,9°
	1200	0,74/ 141,1°	0,14/59,1°	1,5/ 45,5°	0,48/ 173,4°

s-parameters (common emitter) at V_{CE} = 15 V.

I_C mA	f. MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
	40	0,63/−132,3°	0,02/41,8°	33,5/126,6°	0,62/ −72,9°
	100	0,75/−161,1°	0,02/34,0°	16,4/103,0°	0,41/−115,2°
	200	0,78/−174,8°	0,03/40,7°	8,6/ 90,1°	0,34/−139,4°
50	500	0,78/ 169,9°	0,06/56,8°	3,6/ 71,4°	0,34/−153,8°
	800	0,77/ 157,5°	0,08/60,9°	2,3/ 57,6°	0,37/−157,4°
	1000	0,74/ 150,3°	0,10/61,8°	1,9/ 48,8°	0,40/−160,3°
	1200	0,73/ 143,2°	0,12/61,0°	1,5/ 41,2°	0,42/−162,9°
	40	0,63/−140,5°	0,02/41,6°	36,4/125,0°	0,61/ −82,0°
	100	0,76/−164,8°	0,02/37,3°	17,5/102,3°	0,44/−126,8°
	200	0,78/−176,8°	0,03/46,7°	9,1/ 90,3°	0,39/−149,8°
100	500	0,77/ 168,8°	0,06/60,3°	3,8/ 72,6°	0,38/−164,2°
	800	0,76/ 156,7°	0,09/62,1°	2,4/ 60,0°	0,39/−168,6°
	1000	0,73/ 149,6°	0,11/61,7°	2,0/ 51,2°	0,40/−170,8°
	1200	0,72/ 142,6°	0,13/60,2°	1,7/ 44,6°	0,42/−172,6°
	40	0,64/−143,2°	0,02/41,1°	37,6/123,9°	0,60/ −86,5°
	100	0,76/−166,0°	0,02/38,3°	17,9/101,8°	0,45/−131,0°
	200	0,78/−177,5°	0,03/48,1°	9,3/ 90,2°	0,41/−153,1°
150	500	0,77/ 168,2°	0,06/61,2°	3,9/ 73,1°	0,40/−167,7°
	800	0,76/ 156,3°	0,09/62,2°	2,5/ 60,6°	0,40/−172,0°
	1000	0,72/ 149,2°	0,11/61,5°	2,0/ 52,2°	0,41/−174,6°
	1200	0,72/ 142,2°	0,13/59,5°	1,7/ 45,3°	0,42/−176,1°
	40	0,65/−144,0°	0,02/40,6°	38,5/122,8°	0,60/ −90,2°
	100	0,76/−166,7°	0,02/39,0°	18,0/101,2°	0,46/−133,7°
	200	0,78/−177,9°	0,03/49,1°	9,3/ 89,9°	0,42/−155,2°
200	500	0,77/ 168,0°	0,06/61,6°	3,9/ 73,3°	0,41/−169,7°
	800	0,76/ 156,1°	0,09/62,3°	2,5/ 60,9°	0,41/−174,0°
	1000	0,72/ 149,1°	0,11/61,5°	2,1/ 52,8°	0,42/−175,7°
	1200	0,71/ 142,1°	0,13/59,2°	1,7/ 45,8°	0,42/−177,3°
	40	0,66/−144,9°	0,02/40,7°	38,6/122,1°	0,60/ −91,6°
	100	0,76/−167,0°	0,02/39,2°	18,0/100,8°	0,46/−135,4°
	200	0,78/−178,1°	0,03/49,5°	9,3/ 89,7°	0,43/−156,2°
250	500	0,77/ 167,8°	0,06/62,0°	3,9/ 73,2°	0,42/−170,3°
	800	0,76/ 156,1°	0,09/62,4°	2,5/ 61,0°	0,41/−174,8°
	1000	0,72/ 148,9°	0,11/61,5°	2,0/ 52,6°	0,41/−177,2°
	1200	0,72/ 141,8°	0,14/58,8°	1,7/ 45,7°	0,41/−178,3°
	40	0,67/−145,2°	0,02/40,1°	38,7/121,3°	0,59/ −93,3°
	100	0,77/−167,3°	0,02/39,0°	17,9/100,3°	0,46/−136,5°
	200	0,79/−178,2°	0,03/49,6°	9,2/ 89,4°	0,43/−156,8°
300	500	0,78/ 167,7°	0,06/62,0°	3,9/ 72,9°	0,42/−170,6°
	800	0,76/ 156,1°	0,09/62,4°	2,5/ 60,8°	0,41/−174,7°
	1000	0,73/ 148,8°	0,11/61,4°	2,0/ 52,5°	0,41/−177,4°
	1200	0,72/ 142,0°	0,14/59,2°	1,7/ 45,7°	0,42/+177,4°

Conditions for Figs 3 and 4:

V_{CE} = 15 V; I_C = 240 mA;
T_{amb} = 25 °C.

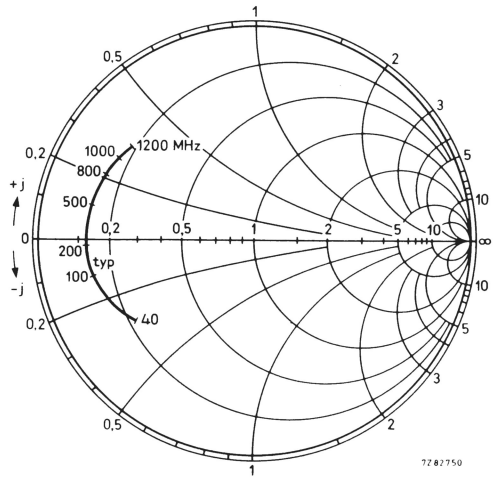


Fig. 3 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

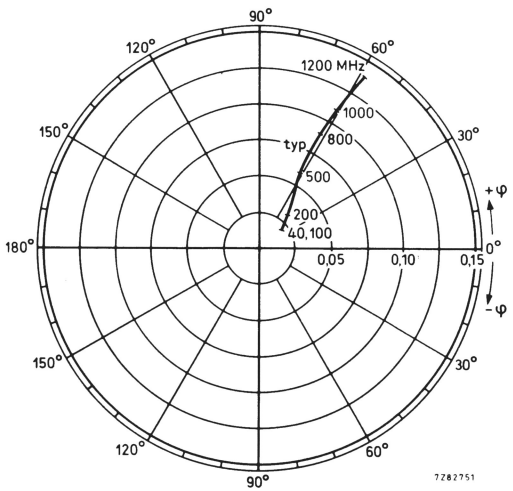


Fig. 4 Reverse transmission coefficient s_{re}.

Conditions for Figs 5 and 6:

V_{CE} = 15 V; I_C = 240 mA;
T_{amb} = 25 °C.

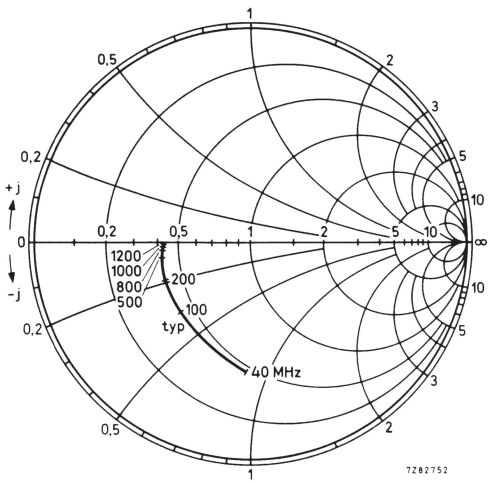


Fig. 5 output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

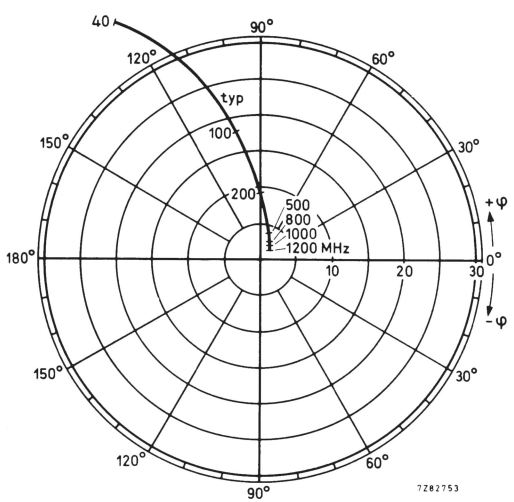


Fig. 6 Forward transmission coefficient s_{fe}.

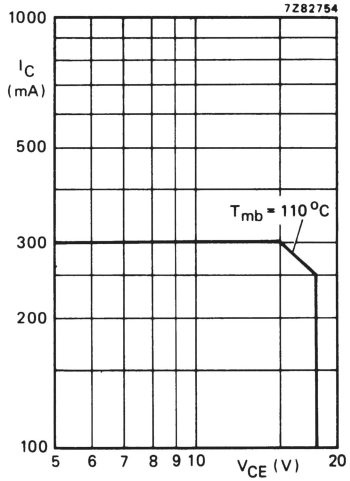


Fig. 7 D.C. SOAR.

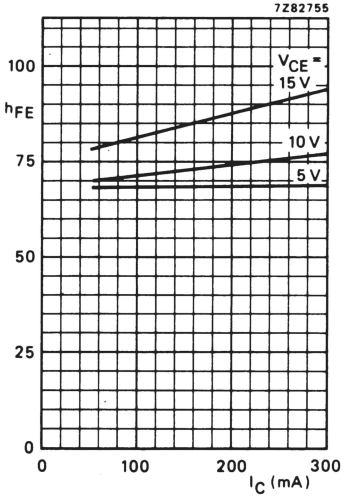


Fig. 8 T_j = 25 °C; typical values.

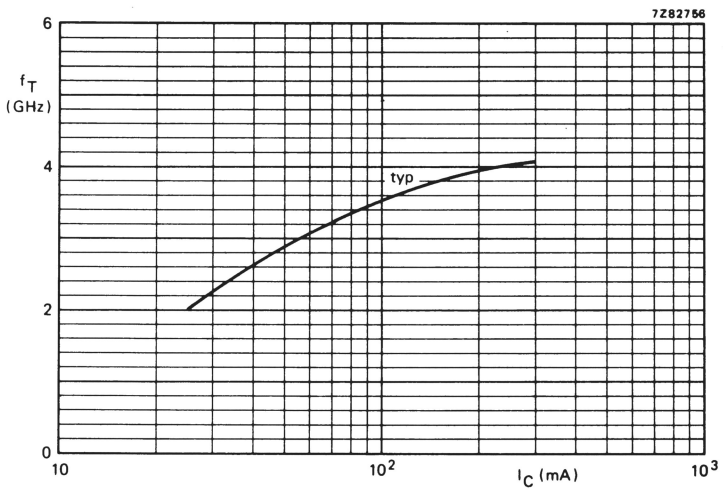


Fig. 9 V_{CE} = 15 V; f = 500 MHz; Tj = 25 °C

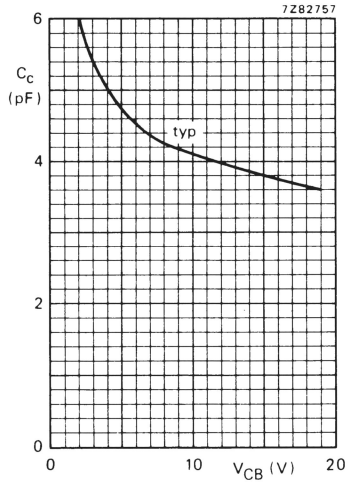


Fig. 10.

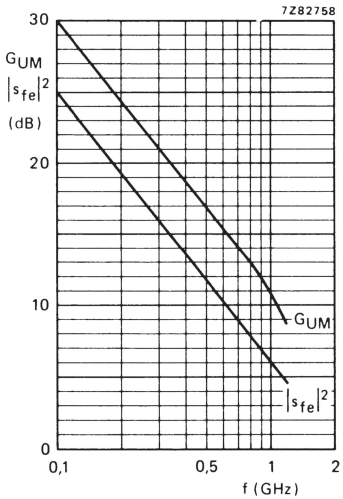


Fig. 11.

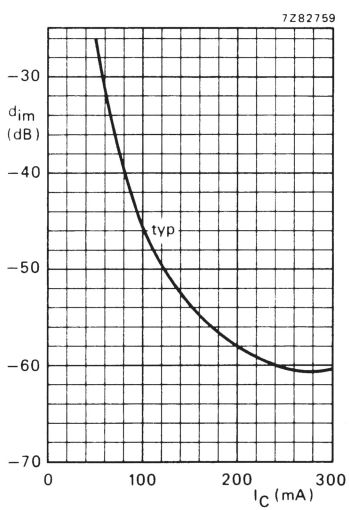


Fig. 12.

Conditions for Figs 10, 11 and 12:

Fig. 10 $I_E = I_e = 0$; $T_{amb} = 25\ ^oC$.

Fig. 11 $V_{CE} = 15$ V; $I_C = 240$ mA; $T_{amb} = 25\ ^oC$; typical values.

Fig. 12 $V_{CE} = 15$ V; $V_o = 1{,}6$ V; $f_{(p+q-r)} = 793{,}25$ MHz; $T_{amb} = 25\ ^oC$; measured in MATV test circuit (see Fig. 2).

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor primarily intended for final stages in MATV system amplifiers. The integrated diffused emitter ballasting resistors and application of gold sandwich metallization ensure an optimum temperature profile and excellent reliability properties.

QUICK REFERENCE DATA

Collector-base voltage, open emitter	V_{CBO}	max.	25	V
Collector-emitter voltage, open base	V_{CEO}	max.	18	V
Collector current (d.c.)	I_C	max.	600	mA
Total power dissipation up to T_{mb} = 110 °C	P_{tot}	max.	9	W
Junction temperature	T_j	max.	200	°C
Transition frequency at f = 500 MHz I_C = 500 mA; V_{CE} = 15 V	f_T	typ.	4	GHz
Maximum unilateral power gain at f = 800 MHz I_C = 500 mA; V_{CE} = 15 V; T_{amb} = 25 °C	G_{UM}	typ.	12,5	dB
Output voltage at d_{im} = −60 dB I_C = 500 mA; V_{CE} = 15 V; R_L = 75 Ω; T_{amb} = 25 °C; $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	2,2	V

MECHANICAL DATA

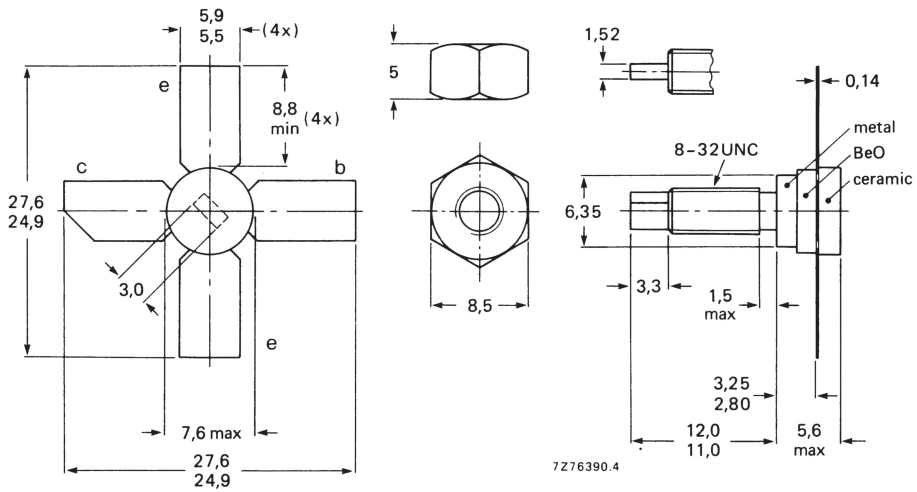
SOT-122 (see Fig. 1).

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg.cm)
max. 0,85 Nm (8,5 kg.cm)

Diameter of clearance hole: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage, open emitter	V_{CBO}	max.	25	V
Collector-emitter voltage, open base	V_{CEO}	max.	18	V
Emitter-base voltage, open collector	V_{EBO}	max.	2	V
Collector current (d.c.)	I_C	max.	600	mA
Total power dissipation up to T_{mb} = 110 °C*	P_{tot}	max.	9	W
Storage temperature	T_{stg}		−65 to + 150	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE*

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	10	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 15 V	I_{CBO}	<	75	μA
D.C. current gain* I_C = 500 mA; V_{CE} = 15 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz* I_C = 500 mA; V_{CE} = 15 V	f_T	typ.	4	GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 15 V	C_c	typ.	7	pF
Emitter capacitance at f = 1 MHz $I_C = i_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	35	pF
Feedback capacitance I_C = 0; V_{CE} = 15 V	C_{re}	typ.	4	pF
Collector-stud capacitance**	C_{cs}	typ.	0,8	pF
Maximum unilateral power gain (s_{re} assumed to be zero) $G_{UM}\ (\text{in dB}) = 10 \log \frac{\lvert s_{fe}\rvert^2}{[1 - \lvert s_{ie}\rvert^2]\ [1 - \lvert s_{oe}\rvert^2]}$ I_C = 500 mA; V_{CE} = 15 V; f = 800 MHz	G_{UM}	typ.	12,5	dB
Output voltage at d_{im} = −60 dB I_C = 500 mA; V_{CE} = 15 V; R_L = 75 Ω; T_{amb} = 25 °C $V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz $V_q = V_o$ −6 dB ; f_q = 803,25 MHz $V_r = V_o$ −6 dB ; f_r = 805,25 MHz measured at $f_{(p+q-r)}$ = 795,25 MHz	V_o	typ.	2,2	V

* Measured under pulse conditions.

** Measured with emitter and base grounded.

DEVELOPMENT DATA

s-parameters (common emitter) at V_{CE} = 15 V

I_C mA	f MHz	s_{ie}	s_{fe}	s_{re}	s_{oe}
	40	0,87/−161,9°	27,9/104,8°	0,017/24,5°	0,60/−140,2°
	100	0,89/−174,2°	11,7/ 92,6°	0,019/29,3°	0,58/−163,7°
	200	0,90/+ 180,0°	5,8/ 85,8°	0,024/43,0°	0,58/−172,5°
100	500	0,89/ 171,6°	2,4/ 70,3°	0,044/59,9°	0,59/−178,3°
	800	0,89/ 167,7°	1,8/ 64,3°	0,056/63,3°	0,60/−179,7°
	1000	0,86/ 159,9°	1,2/ 51,7°	0,086/66,1°	0,60/+ 176,4°
	1200	0,86/ 155,6°	1,1/ 42,4°	0,105/63,7°	0,60/ 173,8°
	40	0,87/−165,2°	29,3/103,8°	0,014/26,2°	0,65/−146,8°
	100	0,90/−175,8°	12,1/ 92,7°	0,017/34,9°	0,65/−167,3°
	200	0,90/+ 179,1°	6,1/ 86,9°	0,023/49,7°	0,65/−175,5°
200	500	0,89/ 170,7°	2,5/ 72,7°	0,046/63,5°	0,65/+ 177,7°
	800	0,89/ 167,3°	1,9/ 68,1°	0,058/65,8°	0,65/ 175,6°
	1000	0,86/ 159,2°	1,3/ 55,3°	0,090/66,5°	0,63/ 170,6°
	1200	0,84/ 155,1°	1,2/ 48,9°	0,109/63,3°	0,62/ 167,8°
	40	0,88/−166,4°	29,6/103,2°	0,013/26,8°	0,67/−149,3°
	100	0,90/−176,1°	12,3/ 92,7°	0,016/36,2°	0,67/−168,5°
	200	0,90/+ 178,6°	6,2/ 86,9°	0,023/51,8°	0,67/−176,2°
300	500	0,89/ 171,0°	2,5/ 73,5°	0,046/69,6°	0,67/+ 176,6°
	800	0,89/ 167,2°	2,0/ 68,7°	0,059/66,4°	0,66/ 174,2°
	1000	0,86/ 159,5°	1,4/ 56,9°	0,091/66,7°	0,64/ 168,7°
	1200	0,85/ 154,5°	1,2/ 49,5°	0,110/63,3°	0,63/ 165,8°
	40	0,88/−166,8°	29,6/102,7°	0,013/26,8°	0,69/−150,8°
	100	0,90/−176,4°	12,1/ 92,4°	0,016/36,9°	0,68/ 169,2°
	200	0,90/+ 178,5°	6,1/ 87,1°	0,023/52,4°	0,68/−176,7°
400	500	0,89/ 170,7°	2,5/ 74,1°	0,047/65,2°	0,68/+ 176,0°
	800	0,89/ 167,2°	2,0/ 69,1°	0,059/66,7°	0,67/ 173,6°
	1000	0,86/ 159,0°	1,3/ 56,4°	0,092/66,7°	0,65/ 168,0°
	1200	0,85/ 154,6°	1,2/ 50,7°	0,111/63,1°	0,64/ 164,9°
	40	0,88/−167,0°	29,3/102,2°	0,013/27,0°	0,69/−151,8°
	100	0,90/−176,6°	12,1/ 92,2°	0,016/37,0°	0,69/−169,5°
	200	0,90/+ 178,6°	6,1/ 86,8°	0,023/52,8°	0,68/−176,8°
500	500	0,89/ 170,5°	2,5/ 73,5°	0,047/65,2°	0,68/+ 175,8°
	800	0,89/ 167,2°	1,9/ 68,5°	0,060/66,8°	0,68/ 173,5°
	1000	0,86/ 159,2°	1,3/ 56,6°	0,092/66,7°	0,65/ 167,7°
	1200	0,84/ 154,8°	1,2/ 50,6°	0,112/63,1°	0,64/ 164,7°

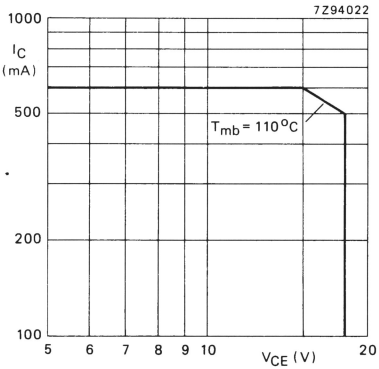


Fig. 2 D.C. SOAR.

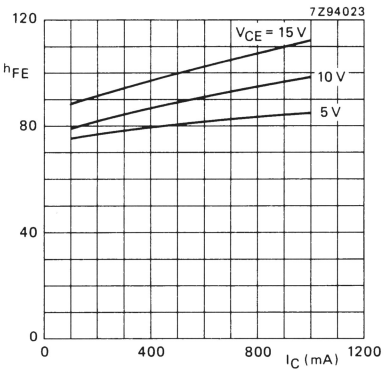


Fig. 3 T_j = 25 °C; typ. values.

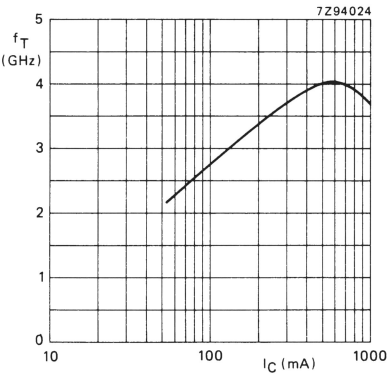


Fig. 4 V_{CE} = 15 V; f = 500 MHz; T_j = 25 °C; typical values.

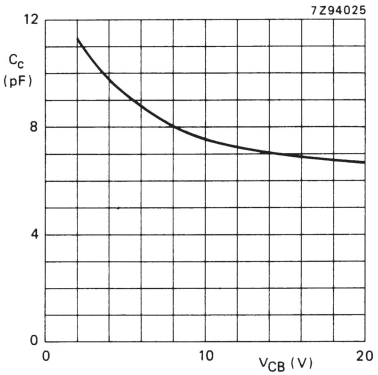


Fig. 5 Typical values.

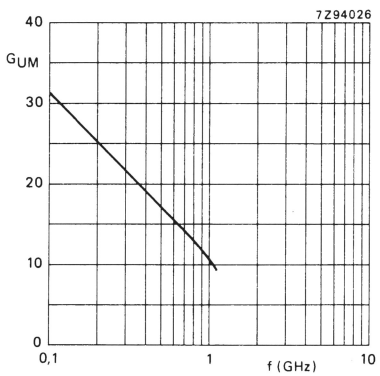
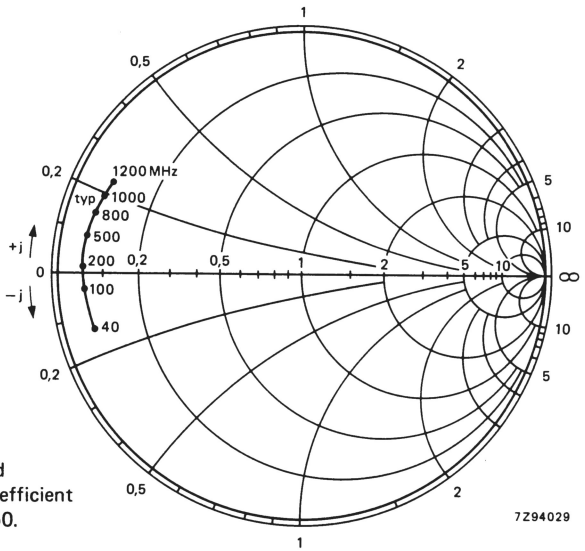


Fig. 6 V_{CE} = 15 V; I_C = 500 mA; T_{amb} = 25 °C; typical values.

DEVELOPMENT DATA

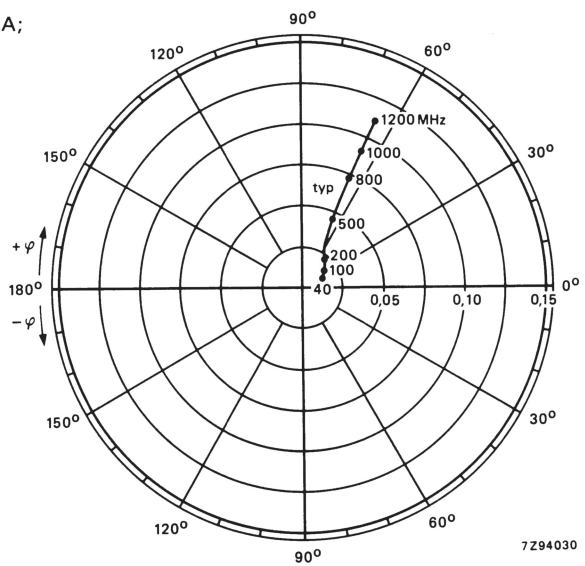


Input impedance derived from input reflection coefficient s_{ie} co-ordinates in Ω x 50.

Fig. 7.

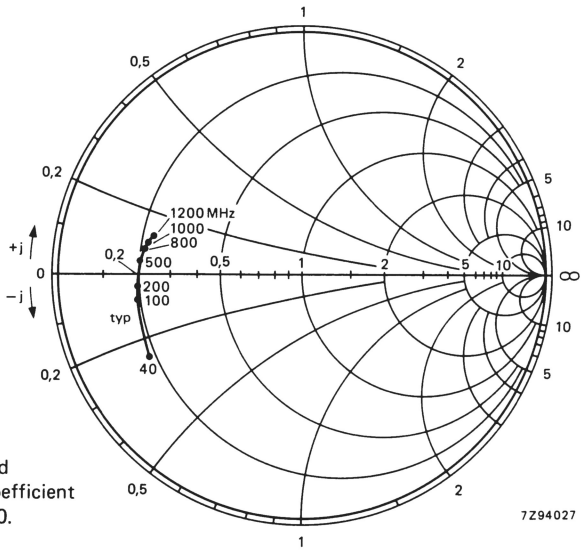
Conditions for Figs 7 and 8:

V_{CE} = 15 V; I_C = 500 mA;
T_{amb} = 25 °C.



Reverse transmission coefficient s_{re}.

Fig. 8.

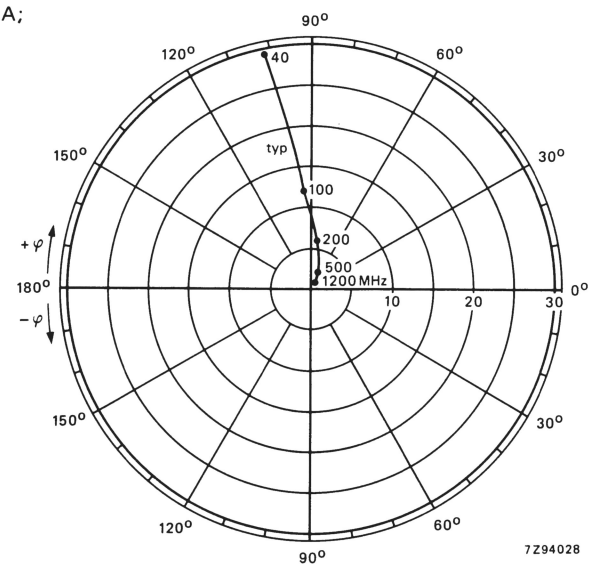


Output impedance derived from output reflection coefficient s_{oe} co-ordinates in Ω x 50.

Fig. 9.

Conditions for Figs 9 and 10:

V_{CE} = 15 V; I_C = 500 mA;
T_{amb} = 25 °C.



Forward transmission coefficient s_{fe}.

Fig. 10.

N-P-N SILICON MICROWAVE TRANSISTOR

The BFR49 is a microwave transistor featuring a high transition frequency and low noise. A miniature ceramic encapsulation is used for compatibility with stripline and microwave circuits. It is suitable for amplifiers up to S-band frequencies in instrumentation and microwave systems.

QUICK REFERENCE DATA

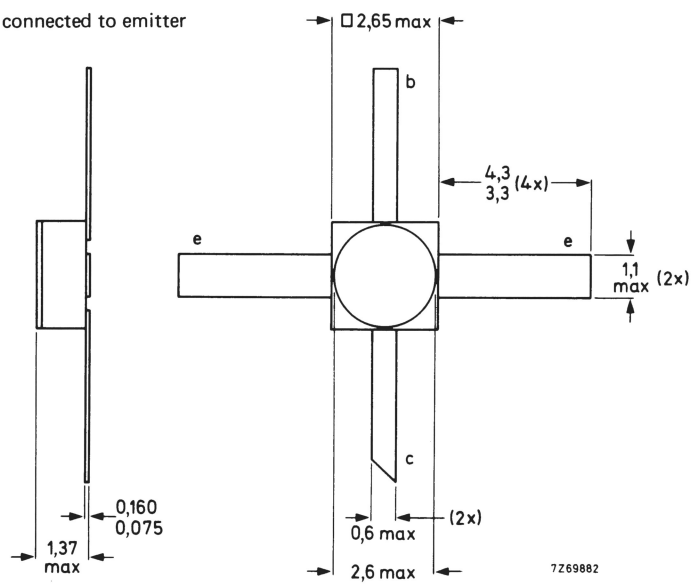
Collector-base voltage (open emitter)	V_{CBO}	max	20 V
Collector-emitter voltage (open base)	V_{CEO}	max	15 V
Collector current (d.c.)	I_C	max	25 mA
Total power dissipation up to T_{amb} = 110 °C	P_{tot}	max	180 mW
Transition frequency I_C = 14 mA; V_{CE} = 10 V	f_T	typ	5 GHz
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 1 GHz	F	typ	2,5 dB
Transducer power gain I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	$\lvert s_{fe} \rvert^2$	typ	15,5 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-100.

Metallized lid connected to emitter



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; I_C = 10 μA)	V_{CBO}	max	20 V
Collector-emitter voltage (open base; I_C = 10 mA)	V_{CEO}	max	15 V
Emitter-base voltage (open collector; I_E = 10 μA)	V_{EBO}	max	2 V
Collector current (d.c.)	I_C	max	25 mA
Total power dissipation up to T_{amb} = 110 °C	P_{tot}	max	180 mW
Storage temperature	T_{stg}		−65 to + 200 °C
Junction temperature	T_j	max	200 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500 K/W

CHARACTERISTICS

T_{amb} = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50 nA
D.C. current gain *			
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	>	25
Transition frequency *			
I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz	f_T	typ	5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ	0,35 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ	1,1 pF
Feedback capacitance at f = 1 MHz			
I_C = 2 mA; V_{CE} = 10 V	C_{re}	typ	0,3 pF
Noise figure at optimum source impedance			
I_C = 2 mA; V_{CE} = 10 V; f = 1 GHz	F	typ	2,5 dB
I_C = 2 mA; V_{CE} = 10 V; f = 4 GHz	F	typ	6,5 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$			
I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	G_{UM}	typ	17,0 dB
I_C = 14 mA; V_{CE} = 10 V; f = 4 GHz	G_{UM}	typ	6,5 dB
Transducer power gain			
I_C = 14 mA; V_{CE} = 10 V; f = 1 GHz	$\lvert s_{fe} \rvert^2$	typ	15,5 dB
I_C = 14 mA; V_{CE} = 10 V; f = 4 GHz	$\lvert s_{fe} \rvert^2$	typ	3,5 dB

* Measured under pulse conditions.

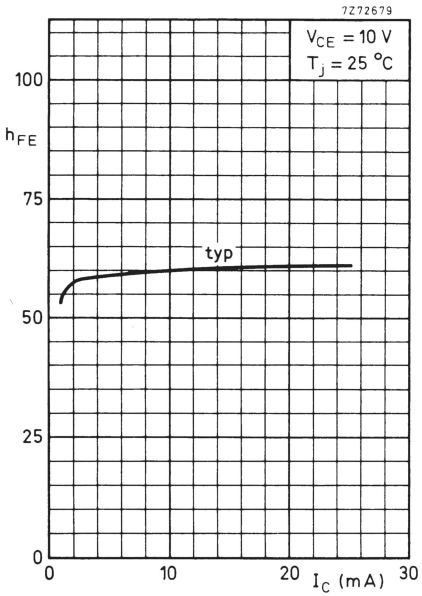


Fig. 2.

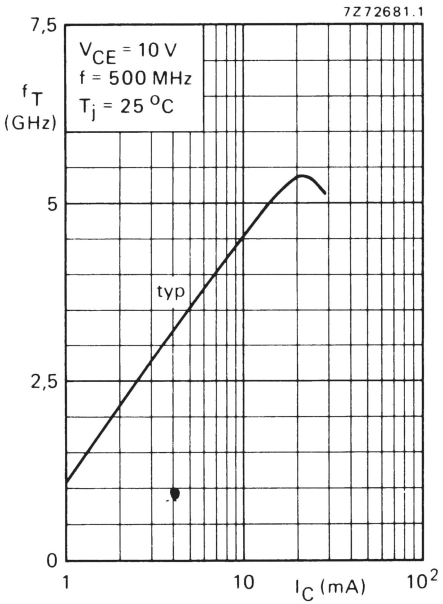


Fig. 3.

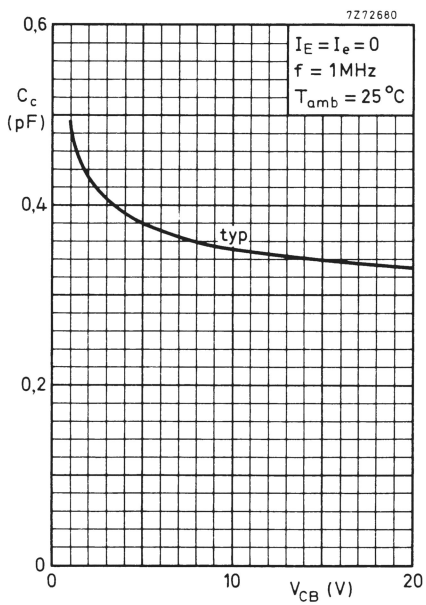


Fig. 4.

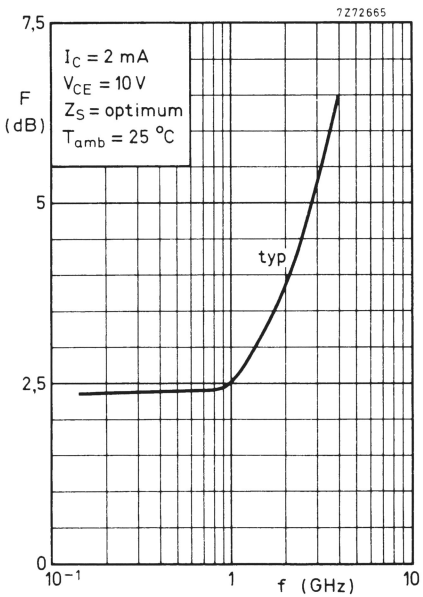


Fig. 5.

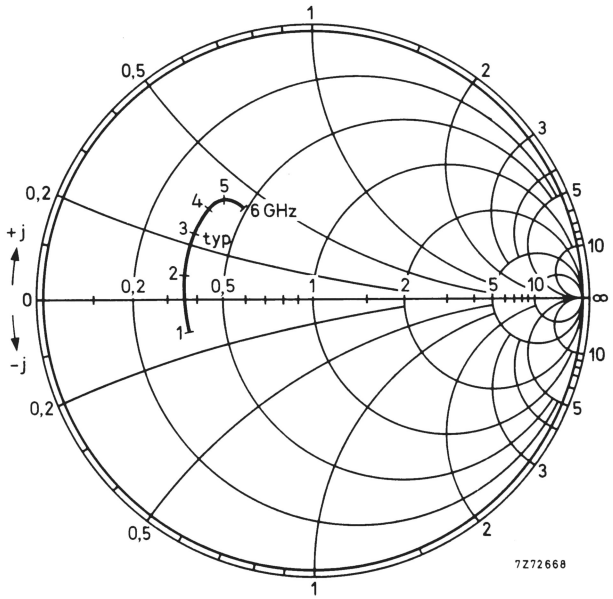


Fig. 6
V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C.

Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

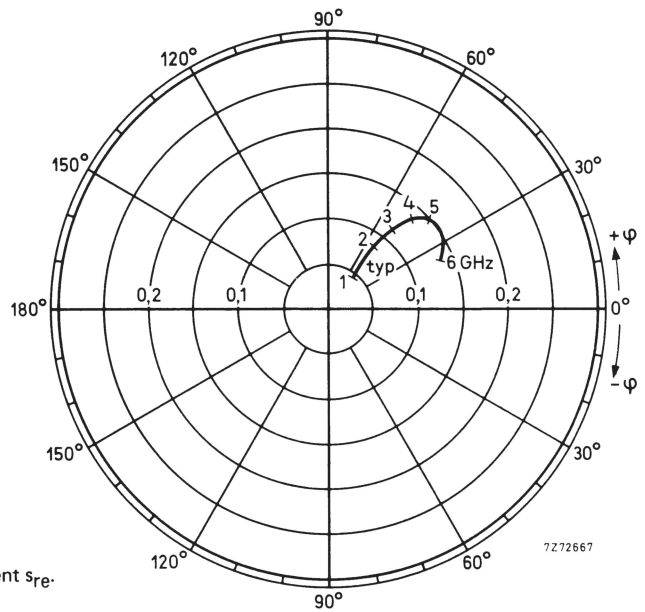


Fig. 7
V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C.

Reverse transmission coefficient s_{re}.

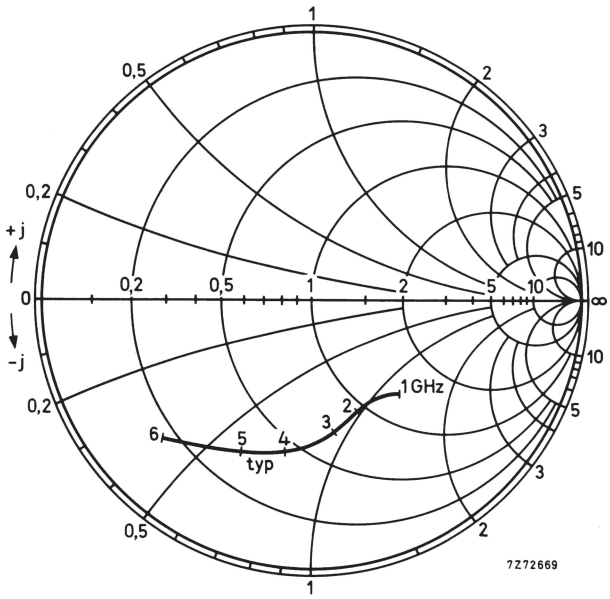


Fig. 8
V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C.

Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

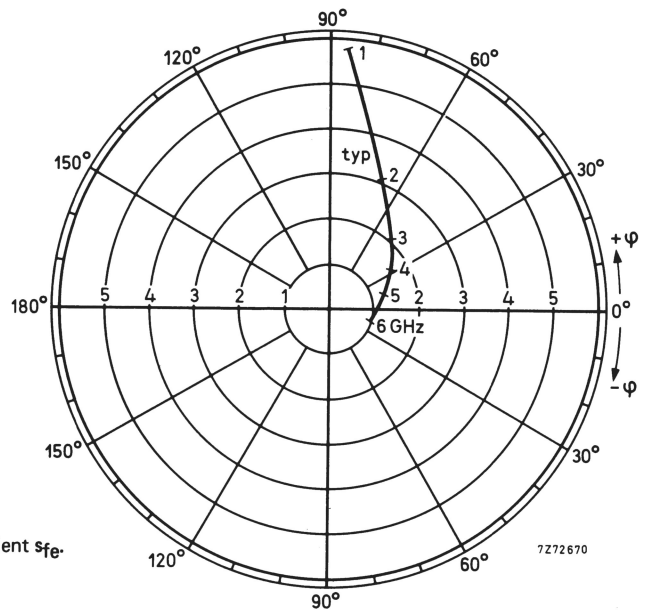


Fig. 9
V_{CE} = 10 V
I_C = 14 mA
T_{amb} = 25 °C.

Forward transmission coefficient s_{fe}.

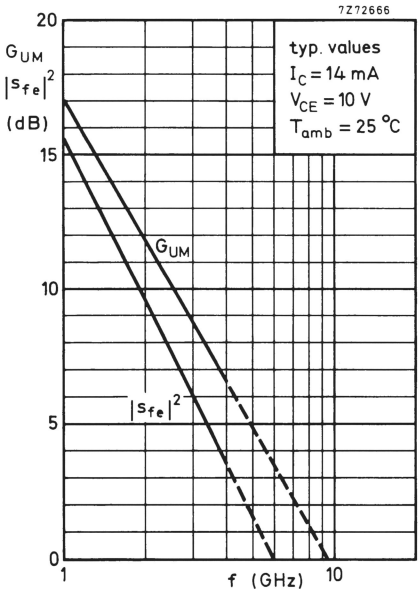

7Z72666
20
15
10
5
0
G_{UM}
$|s_{fe}|^2$
(dB)
typ. values
$I_C = 14$ mA
$V_{CE} = 10$ V
$T_{amb} = 25$ °C
G_{UM}
$|s_{fe}|^2$
1
f (GHz)
10

Fig. 10.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a capstan envelope. The transistor has extremely good intermodulation properties and high power gain.

The device is primarily intended for:

a Final and driver stages of channel and band aerial amplifiers with high output power for band I, II, III and IV/V (40-860 MHz).
b Final and driver stages of wideband amplifiers (40-230 MHz).
c Final stages of the wideband vertical amplifier in high-speed oscilloscopes.
d Frequency multiplier and oscillator circuits.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value)	I_{CM}	max.	500 mA
Total power dissipation up to T_{mb} = 60 °C; f ⩾ 1 MHz	P_{tot}	max.	3,5 W
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz I_C = 75 mA; V_{CE} = 20 V	f_T	>	1200 MHz
Output power at f = 200 MHz I_C = 70 mA; V_{CE} = 20 V; d_{im} = −30 dB	P_o	typ.	150 mW
Power gain at f = 200 MHz I_C = 70 mA; V_{CE} = 20 V	G_p	typ.	16 dB

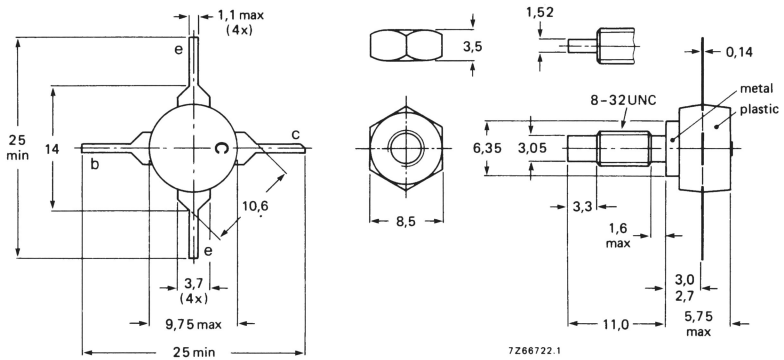
MECHANICAL DATA (see next page)

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic.
The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V	1)
Collector-emitter voltage (R_{BE} = 10 Ω; peak value)	V_{CERM}	max.	40	V	2)
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V	2)
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V	3)

Currents

Collector current (d.c.)	I_C	max.	200	mA
Collector current (peak value) f > 1 MHz	I_{CM}	max.	500	mA

Power dissipation (f > 1 MHz; see SOAR)

Total power dissipation up to T_{mb} = 60 °C	P_{tot}	max.	3,5	W

Temperatures

Storage temperature	T_{stg}	−40 to +150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	25	°C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5	°C/W

1) at I_C = 100 μA. 2) at I_C = 10 mA. 3) at I_E = 100 μA.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 20 V	I_{CBO}	<	10	μA
Saturation voltage				
I_C = 100 mA; I_B = 10 mA	V_{CEsat}	<	0,75	V
D.C. current gain				
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	>	25	
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 20 V	C_c	<	4,5	pF
Feedback capacitance at f = 1 MHz				
I_C = 10 mA; V_{CE} = 20 V; T_{mb} = 25 °C	C_{re}	typ.	1,7	pF
Noise figure at f = 200 MHz				
I_C = 40 mA; V_{CE} = 20 V; R_S = 75 Ω; T_{mb} = 25 °C	F	typ.	6	dB
Transition frequency at f = 500 MHz				
I_C = 15 mA; V_{CE} = 20 V	f_T	typ.	1000	MHz
I_C = 75 mA; V_{CE} = 20 V	f_T	>	1200	MHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	1200	MHz
Output power at f = 200 MHz; T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2 f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB measured at $f_{(2q-p)}$ = 208 MHz (channel 9)	P_o	> typ.	130 150	mW mW
Output power at f = 800 MHz; T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2 f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB measured at $f_{(2q-p)}$ = 806 MHz (channel 62)	P_o	> typ.	70 90	mW mW
Power gain (not neutralized) T_{mb} = 25 °C				
I_C = 70 mA; V_{CE} = 20 V; f = 200 MHz	G_p	> typ.	15 16	dB dB
I_C = 70 mA; V_{CE} = 20 V; f = 800 MHz	G_p	typ.	6,5	dB

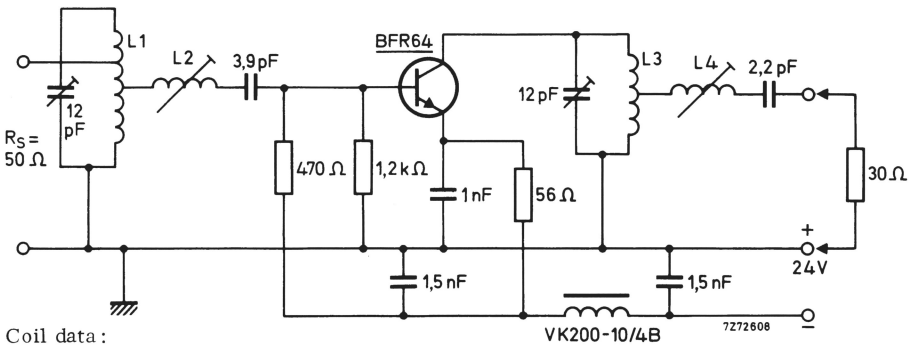
CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{mb} = 25 °C

   I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2
   f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
   measured at $f_{(2q-p)}$ = 208 MHz (channel 9)

Test circuit:



Coil data:

L1 = 3 turns silver-plated Cu wire (1, 4 mm); winding pitch 2, 7 mm; int. dia. 8 mm; taps at 0, 5 turn and 1, 5 turns from earth.
L2 = 5, 5 turns silver-plated Cu wire (1, 4 mm); winding pitch 2, 2 mm; int. dia. 8 mm
L3 = 3 turns silver-plated Cu wire (1, 4 mm); winding pitch 3, 3 mm; int. dia. 8 mm
L4 = 5, 5 turns silver-plated Cu wire (1, 4 mm); winding pitch 2, 2 mm; int. dia. 11 mm

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current-voltage clipping.
The maximum undistorted output power is realized, if

a. Current and voltage clipping take place concurrently.
This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

in which V_{CEK} is the high-frequency knee voltage.

b. The h.f. collector current is as small as possible.
This is so if $-C_L = +C_{oe}$,
in which C_{oe} is the output capacitance of the transistor at short-circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 220\ \Omega$; $C_L = -4$ pF.

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 4 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (VSWR = 1).
After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band-pass curve.
The VSWR of the output will then, in most cases, be ≤ 2 over the whole channel.
Corrections can be made by tuning L2; this will not disturb the band-pass curve.

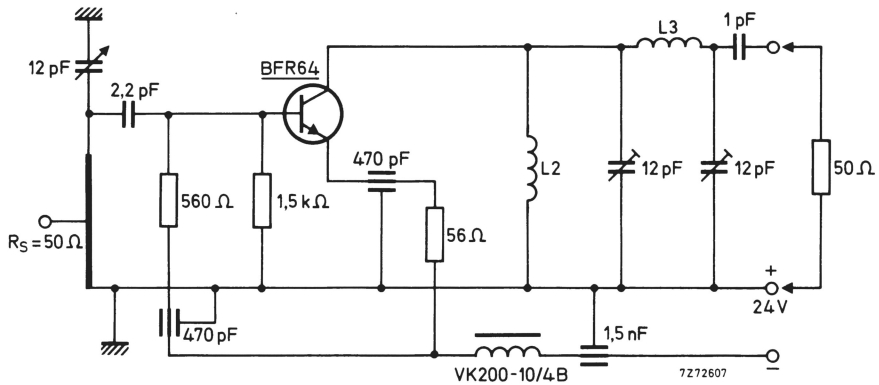
CHARACTERISTICS (continued)

Intermodulation characteristics

2. Output power at f = 800 MHz; T_{mb} = 25 °C

I_C = 70 mA; V_{CE} = 20 V; VSWR at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (channel 62)

Test circuit:



Coil data:

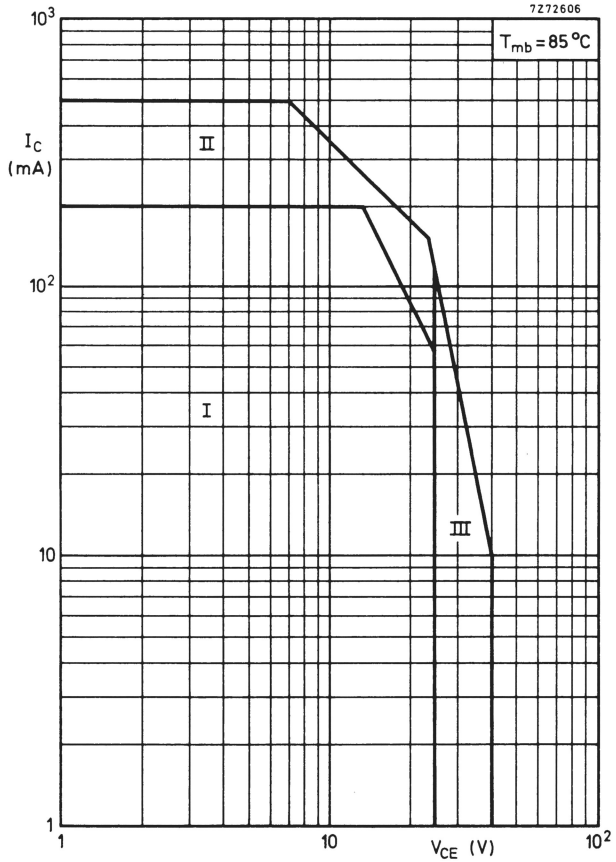
L1 = 25 mm x 7 mm x 0,85 mm silver-plated Cu strip
Tap of the input at 5 mm from earth.
L2 = 13 turns enamelled Cu wire (0,6 mm); int. dia. 8 mm
L3 = 1,5 turns Cu wire (1,3 mm); int. dia. 8 mm

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearily with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

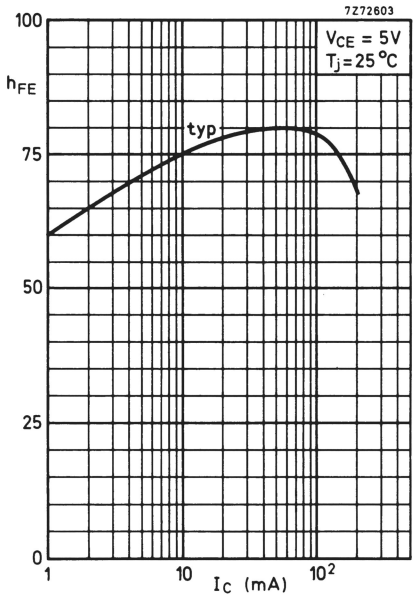
$$P_O = \frac{I_C(V_{CE} - V_{CEK})}{2} = 480 \text{ mW}.$$

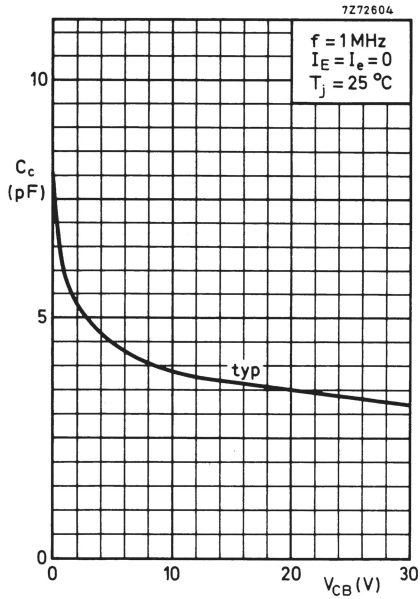
The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_O = 480 mW. With this adjusting method, care must be taken that the transistor is not damaged by second breakdown (the voltage swing may not exceed the rated V_{CER} value). Therefore as soon as clipping occurs, the increase of the input signal should be stopped until the clipping has been eliminated. After this adjustment has been made no further change may be made in the output circuit. Adjust the input circuit for maximum power gain and good band-pass curve. The VSWR of the output is then ≤ 2 over the whole channel.

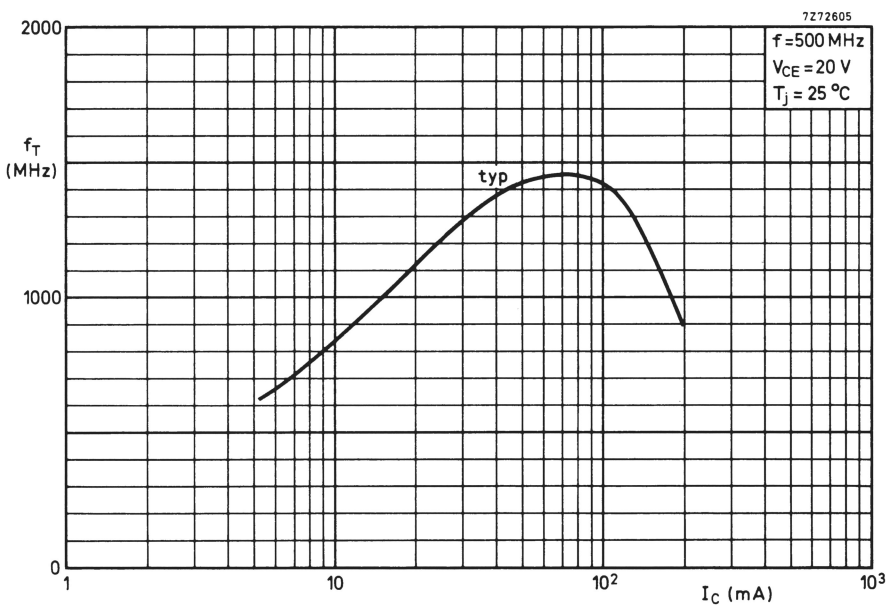


Safe Operating Area with the transistor forward biased

I Region of permissible d.c. operation
II Permissible extension for repetitive pulsed operation; f > 1 MHz
III Repetitive pulse operation in this region is allowable, provided $R_{BE} < 10\ \Omega$ and f > 1 MHz


7Z72603
100
75
50
25
0
h_{FE}
V_{CE} = 5V
T_j = 25 °C
typ
1
10
10^2
I_C (mA)


7Z72604
10
5
0
C_c (pF)
f = 1 MHz
$I_E = I_e = 0$
T_j = 25 °C
typ
0
10
20
30
V_{CB} (V)


7Z72605
2000
1000
0
f_T (MHz)
f = 500 MHz
V_{CE} = 20 V
T_j = 25 °C
typ
1
10
10^2
10^3
I_C (mA)

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter silicon transistor in a capstan envelope. The transistor has extremely good inter-modulation properties and high power gain.

The device is primarily intended for channel amplifiers in aerial amplifier systems as well as other applications where an excellent f_T linearity and higher signal handling capabilities than available in existing devices are required.

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V
Collector current (peak value)	I_{CM}	max.	1000	mA
Junction temperature	T_j	max.	200	°C
Thermal resistance from junction to mounting base	$R_{th\ j\text{-}mb}$	=	15	°C/W
Transition frequency at f = 500 MHz I_C = 200 mA; V_{CE} = 20 V	f_T	>	1200	MHz
Output power at f = 200 MHz I_C = 200 mA; V_{CE} = 20 V; d_{im} = −30 dB	P_o	typ.	450	mW
Power gain at f = 200 MHz I_C = 200 mA; V_{CE} = 20 V	G_p	typ.	19	dB

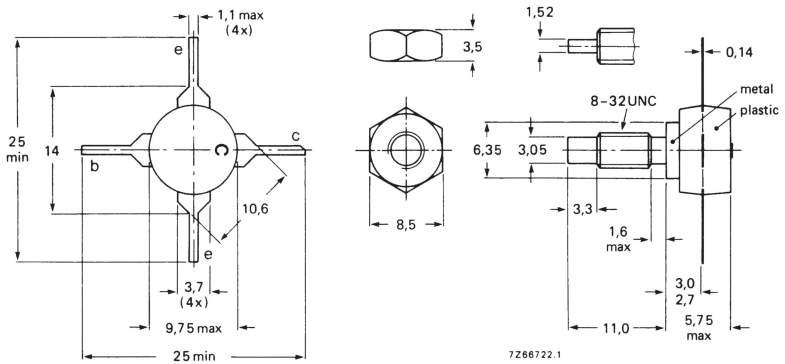
MECHANICAL DATA (see next page)

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm (7,5 kg cm)
0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (R_{BE} = 10 Ω; peak value)	V_{CERM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current (d.c.)	I_C	max.	400 mA
Collector current (peak value) f > 1 MHz	I_{CM}	max.	1000 mA
Total power dissipation up to T_{mb} = 125 °C see also page 6	P_{tot}	max.	5 W
Storage temperature	T_{stg}	−65 to	+200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15 °C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,5 °C/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 1 mA	$V_{(BR)CBO}$	>	40	V
Collector-emitter voltage R_{BE} = 10 Ω, I_C = 5 mA open base, I_C = 5 mA	$V_{(BR)CER}$ $V_{(BR)CEO}$	> >	40 25	V V
Emitter-base voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	3.5	V
Collector cut-off current				
I_E = 0; V_{CB} = 20 V	I_{CBO}	<	100	μA
Saturation voltage				
I_C = 200 mA; I_B = 20 mA	V_{CEsat}	<	0.75	V
D.C. current gain				
I_C = 200 mA; V_{CE} = 20 V I_C = 400 mA; V_{CE} = 20 V	h_{FE} h_{FE}	> >	30 20	
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 20 V	C_c	<	10	pF
Feedback capacitance at f = 1 MHz				
I_C = 10 mA; V_{CE} = 20 V; T_{mb} = 25 °C	C_{re}	typ.	3.5	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF
Transition frequency at f = 500 MHz				
I_C = 200 mA; V_{CE} = 20 V I_C = 400 mA; V_{CE} = 20 V	f_T f_T	> >	1200 1000	MHz MHz
Output power at f = 200 MHz; T_{mb} = 25 °C				
I_C = 200 mA; V_{CE} = 20 V; V.S.W.R. at output < 2 f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB measured at $f_{(2q-p)}$ = 208 MHz (channel 9)	P_o	typ.	450	mW
Power gain (not neutralized) T_{mb} = 25 °C				
I_C = 200 mA; V_{CE} = 20 V; f = 200 MHz	G_p	> typ.	15 19	dB dB
I_C = 200 mA; V_{CE} = 20 V; f = 800 MHz	G_p	typ.	4.5	dB

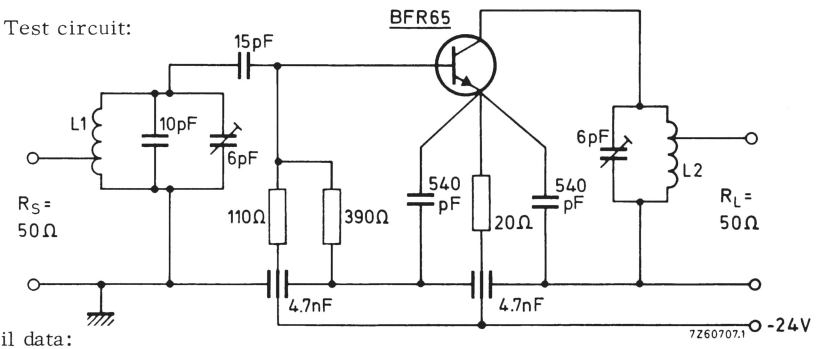
CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{mb} = 25 °C

I_C = 200 mA; V_{CE} = 20 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (channel 9)

Test circuit:



Coil data:

L1 = 1 turn silver plated Cu wire (1.4 mm); int. diam. 8 mm; tap at 0.75 turn from earth.
L2 = 3 turns silver plated Cu wire (1.4 mm); int. diam. 8 mm; winding pitch 2.7 mm; tap at 2.5 turns from earth.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current − voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

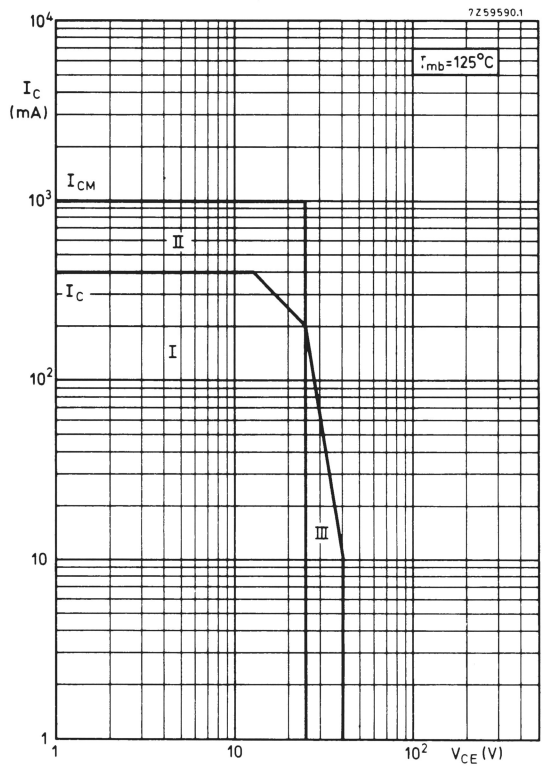
   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 91\ \Omega$; $C_L = -6.8$ pF.

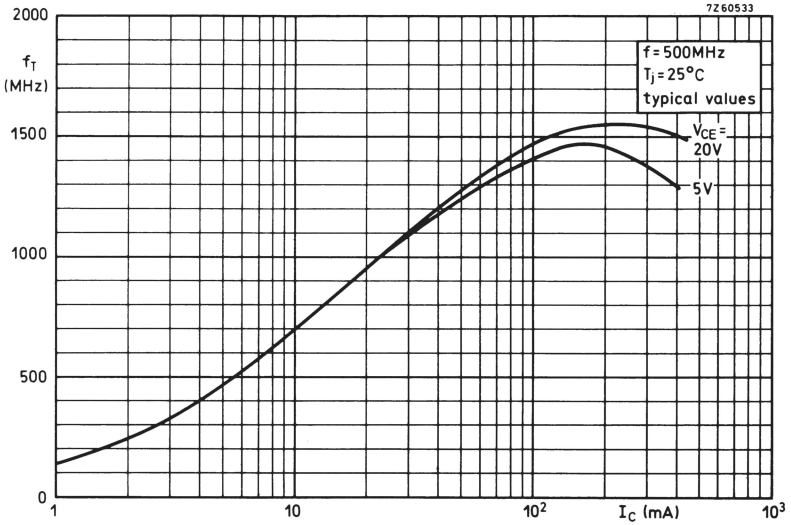
Adjustment procedure

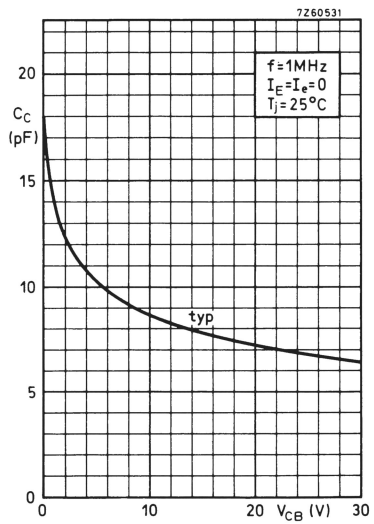
1. Remove the transistor and connect a dummy consisting of a 91 Ω resistor in parallel with a 6.8 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1)
   After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.

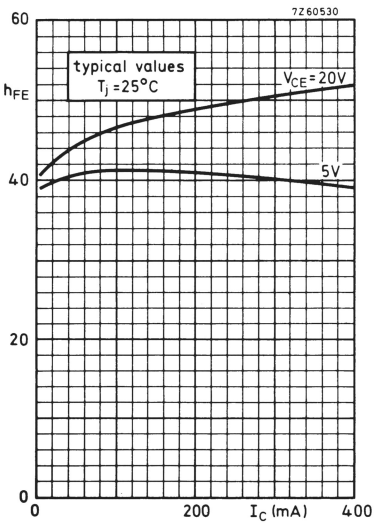


Safe Operating Area with the transistor forward biased

I Region of permissible d.c. operation
II Permissible extension for repetitive pulsed operation; f > 1 MHz
III Repetitive pulsed operation in this region is allowable, provided f > 1 MHz; R_{BE} < 10 Ω


7Z60533
2000
f_T (MHz)
1500
1000
500
0
1
10
10^2
10^3
I_C (mA)
f=500MHz
T_j=25°C
typical values
V_{CE}= 20V
5V


7Z60531
20
C_C (pF)
15
10
5
0
0
10
20
30
V_{CB} (V)
f=1MHz
I_E=I_e=0
T_j=25°C
typ.


7Z60530
60
h_{FE}
40
20
0
0
200
400
I_C (mA)
typical values
T_j=25°C
V_{CE}=20V
5V

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.
The transistor features low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,4	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4	dB
Max. unilateral power gain I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	19,5	dB
Intermodulation distortion at T_{amb} = 25 °C I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; V_o = 150 mV $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ.	−60	dB

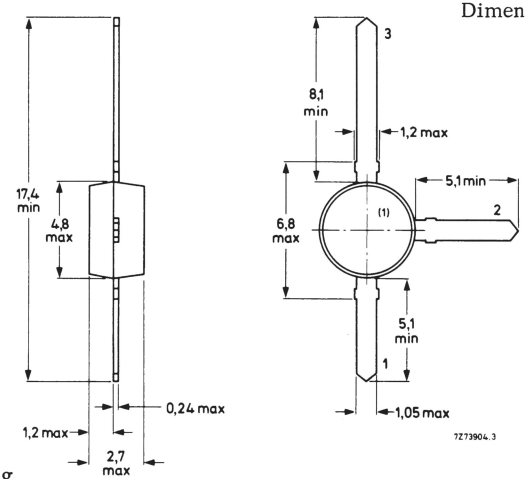
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0	V
Current				
Collector current (d.c.)	I_C	max.	25	mA
Power dissipation				
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

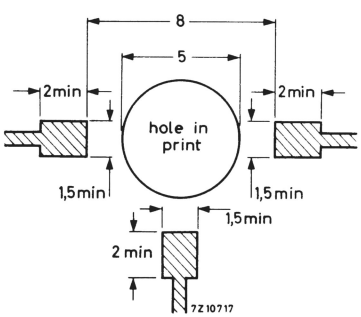
THERMAL RESISTANCE

From junction to ambient in free air

mounted on a glass-fibre print *)
of 40 mm x 25 mm x 1 mm $R_{th\ j\text{-}a}$ = 0,5 °C/mW

*) Requirements for glas-fibre print

(dimensions in mm)



CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA
D.C. current gain [1]				
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	>	40	
		typ.	90	
Transition frequency at f = 500 MHz [1]				
I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,5	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,2	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,4	pF
Noise figure at optimum source impedance				
I_C = 2 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	2,4	dB
Max. unilateral power gain (s_{re} assumed to be zero)				
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$				
I_C = 14 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	19,5	dB

[1]) Measured under pulse conditions.

CHARACTERISTICS (continued)

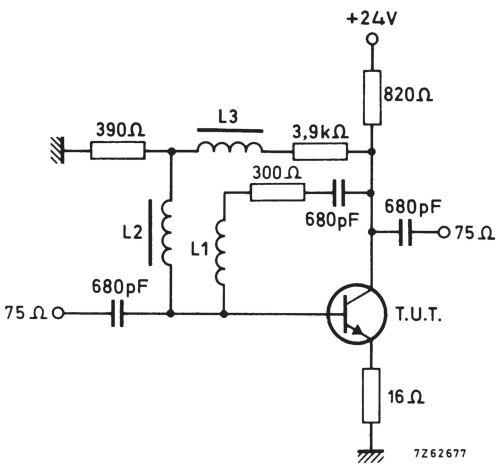
Intermodulation distortion at T_{amb} = 25 °C

I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; V.S.W.R. < 2

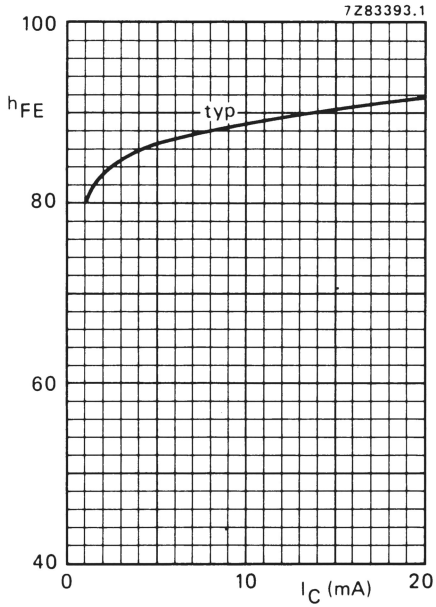
$V_p = V_o$ = 150 mV at f_p = 495,25 MHz
$V_q = V_o$ − 6 dB at f_q = 503,25 MHz
$V_r = V_o$ − 6 dB at f_r = 505,25 MHz

Measured at $f_{(p+q-r)}$ = 493,25 MHz d_{im} typ. −60 dB

Intermodulation test circuit:



L1 = 4 turns Cu wire (0,35 mm); winding pitch 1 mm; int. diam. 4 mm
L2 and L3 5 µH (code number: 3122 108 20150)



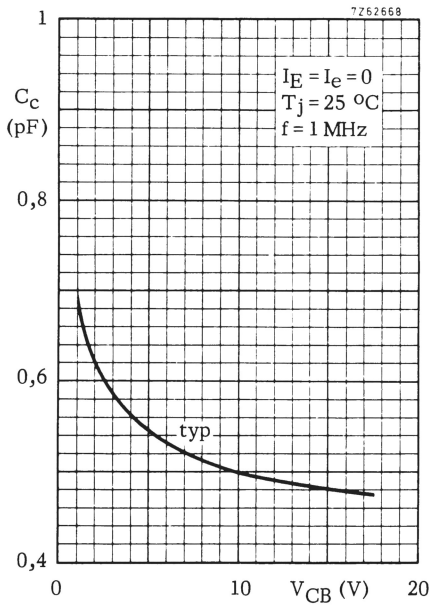
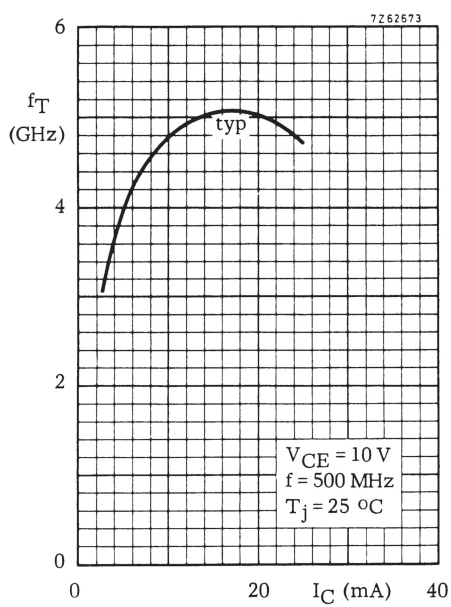
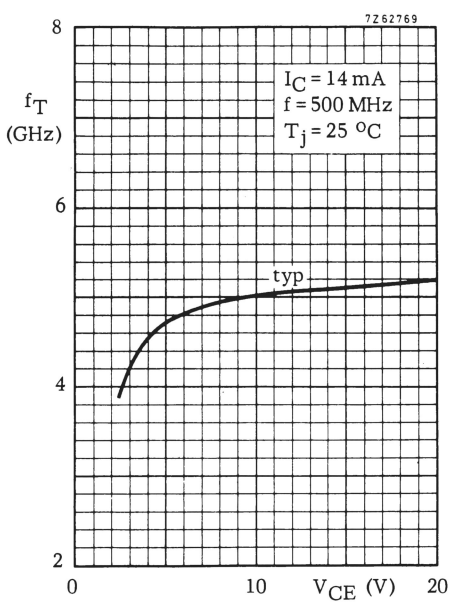
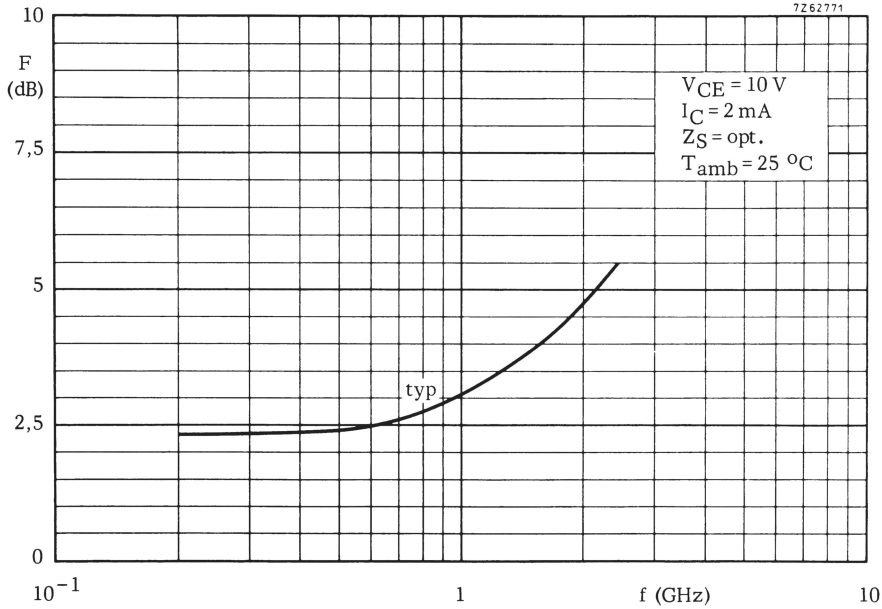
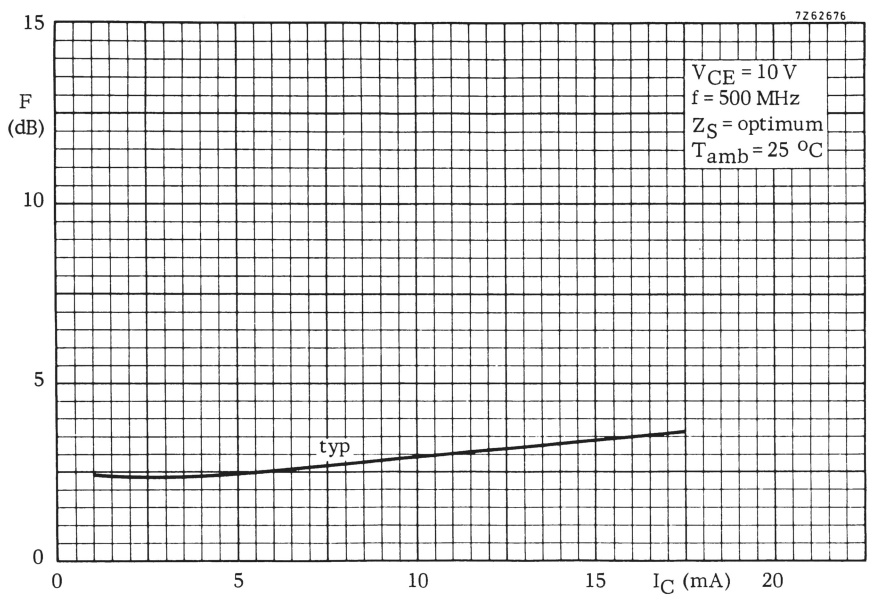


Fig. 4 V_{CE} = 10 V; T_j = 25 °C.






7Z62771
10
F
(dB)
7,5
5
2,5
0
10^{-1}
1
f (GHz)
10
typ
V_{CE} = 10 V
I_C = 2 mA
Z_S = opt.
T_{amb} = 25 °C


7Z62676
15
F
(dB)
10
5
0
0
5
10
15
I_C (mA)
20
typ
V_{CE} = 10 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C

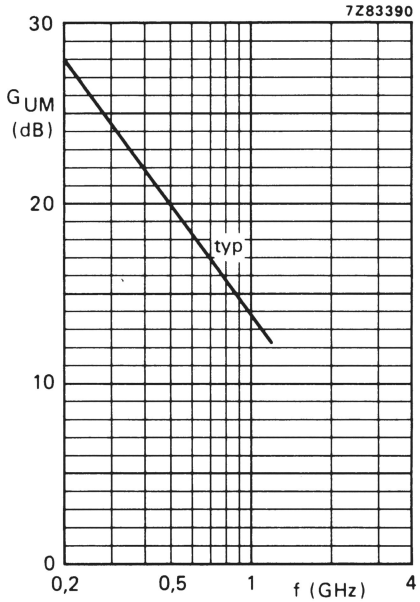
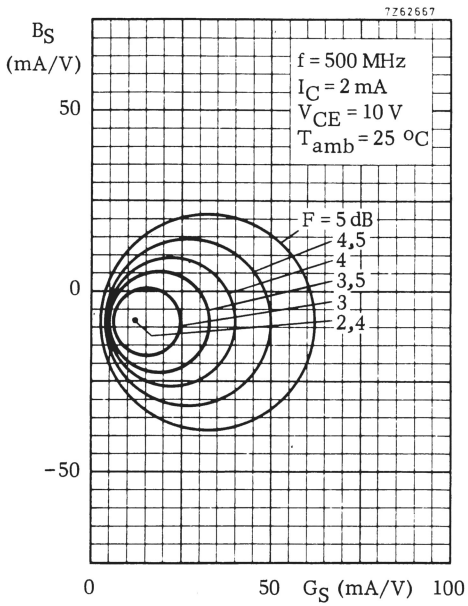


Fig. 10 V_{CE} = 10 V: I_C = 14 mA; T_{amb} = 25 °C.

circles of constant noise figure



SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package primarily intended for use in v.h.f. and u.h.f. wideband amplifiers.

Features of this product:

- low noise;
- low intermodulation distortion;
- high power gain;
- gold metallization.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open-base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	25	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,35	pF
Noise figure at R_S = 60 Ω I_C = 4 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	1,8	dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150	mV
Output power at 1 dB gain compression	P_{L1}	typ.	+ 8	dBm ←
Third order intercept point	ITO	typ.	+ 27	dBm ←

MECHANICAL DATA

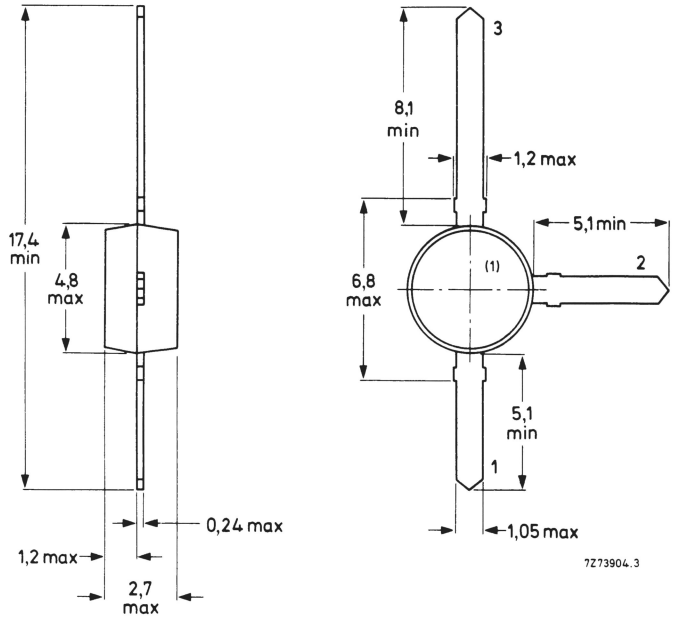
SOT-37 (see Fig. 1).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections
1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	500 K/W

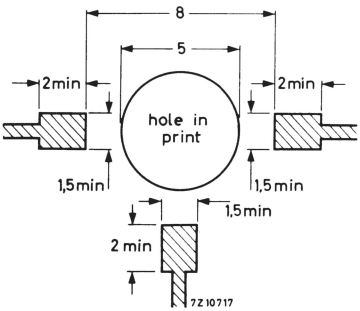


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA
D.C. current gain *				
I_C = 14 mA; V_{CE} = 10 V	h_{FE}	>	40	
		typ.	90	
Transition frequency at f = 500 MHz *				
I_C = 14 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	0,6	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	1,2	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	0,35	pF
Noise figure at T_{amb} = 25 °C				
I_C = 4 mA; V_{CE} = 10 V; R_S = 60 Ω; f = 800 MHz	F	typ.	1,8	dB
I_C = 4 mA; V_{CE} = 10 V; $Z_S = Z_{Sopt}$; f = 2 GHz	F	typ.	3,6	dB

* Measured under pulse conditions.

s-parameters (common emitter)

V_{CE} V	I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
5	2	40	0,91/ −7,7°	0,01/84°	6,8/173°	1,00/ −2,7°
		200	0,79/ −37,3°	0,03/71°	6,5/143°	0,93/−12,5°
		500	0,52/ −81,0°	0,06/59°	4,6/116°	0,80/−22,5°
		800	0,34/−114,5°	0,08/58°	3,3/ 97°	0,73/−27,0°
		1000	0,26/−137,6°	0,09/59°	2,8/ 87°	0,70/−30,0°
		1200	0,22/−165,0°	0,10/61°	2,4/ 79°	0,67/−33,0°
5	5	40	0,80/ −11,7°	0,01/81°	14,4/169°	0,99/ −4,5°
		200	0,59/ −51,0°	0,03/68°	11,2/134°	0,85/−17,0°
		500	0,29/ −95,0°	0,05/66°	6,3/103°	0,70/−22,0°
		800	0,16/−130,0°	0,07/69°	4,2/ 88°	0,64/−26,0°
		1000	0,12/−162,0°	0,09/70°	3,4/ 81°	0,63/−28,0°
		1200	0,12/+ 158,0°	0,10/71°	2,9/ 74°	0,61/−31,0°
5	10	40	0,67/ −16,7°	0,01/80°	23,3/164°	0,97/ −6,6°
		200	0,39/ −63,0°	0,02/70°	14,5/122°	0,76/−18,0°
		500	0,15/−109,0°	0,05/73°	7,0/ 96°	0,64/−20,0°
		800	0,09/−152,0°	0,07/75°	4,6/ 84°	0,60/−24,0°
		1000	0,07/+ 155,0°	0,09/75°	3,7/ 77°	0,59/−26,0°
		1200	0,10/+ 124,0°	0,11/74°	3,1/ 72°	0,58/−29,0°
5	14	40	0,58/ −20,0°	0,01/79°	28,3/160°	0,96/ −7,8°
		200	0,30/ −71,0°	0,02/72°	15,5/117°	0,72/−18,0°
		500	0,11/−119,0°	0,05/75°	7,2/ 93°	0,62/−19,0°
		800	0,07/−177,0°	0,07/77°	4,6/ 82°	0,59/−23,0°
		1000	0,08/+ 138,0°	0,09/76°	3,8/ 76°	0,58/−25,0°
		1200	0,12/+ 118,0°	0,11/76°	3,2/ 71°	0,57/−28,0°
5	20	40	0,49/ −25,0°	0,01/78°	32,9/157°	0,94/ −9,0°
		200	0,22/ −82,0°	0,02/74°	15,9/112°	0,69/−17,0°
		500	0,09/−143,0°	0,05/78°	7,1/ 91°	0,61/−18,0°
		800	0,08/+ 160,0°	0,07/78°	4,5/ 80°	0,59/−22,0°
		1000	0,10/+ 130,0°	0,09/78°	3,7/ 75°	0,58/−24,0°
		1200	0,14/+ 115,0°	0,11/77°	3,1/ 69°	0,57/−28,0°
5	30	40	0,36/ −38,9°	0,01/76°	31,2/151°	0,90/−10,3°
		200	0,18/−122,0°	0,02/75°	14,0/106°	0,66/−14,0°
		500	0,15/−175,0°	0,05/80°	6,1/ 88°	0,61/−16,0°
		800	0,17/+ 148,0°	0,07/80°	3,9/ 78°	0,59/−21,0°
		1000	0,19/+ 131,0°	0,09/79°	3,1/ 72°	0,59/−24,0°
		1200	0,23/+ 119,0°	0,11/79°	2,7/ 67°	0,57/−28,0°

s-parameters (common emitter)

V_{CE} V	I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
10	2	40	0,91/ −7,5°	0,01/84°	7,0/173°	1,00/ −2,6°
		200	0,81/ −36,0°	0,03/72°	6,3/149°	0,94/−12,0°
		500	0,54/ −78,0°	0,06/59°	4,6/118°	0,82/−21,0°
		800	0,35/−110,0°	0,08/58°	3,4/ 98°	0,74/−26,0°
		1000	0,27/−132,0°	0,08/59°	2,8/ 89°	0,72/−29,0°
		1200	0,22/−159,0°	0,09/61°	2,5/ 80°	0,69/−0,32°
10	5	40	0,81/ −11,1°	0,01/82°	14,4/169°	0,99/ −4,3°
		200	0,61/ −48,0°	0,03/69°	11,1/135°	0,86/−16,0°
		500	0,31/ −90,0°	0,05/66°	6,4/105°	0,71/−22,0°
		800	0,17/−120,0°	0,07/69°	4,3/ 90°	0,66/−25,0°
		1000	0,11/−148,0°	0,08/70°	3,5/ 82°	0,64/−27,0°
		1200	0,10/+ 167,0°	0,10/71°	3,0/ 76°	0,63/−30,0°
10	10	40	0,70/ −15,2°	0,01/80°	23,0/164°	0,97/ −6,1°
		200	0,42/ −58,0°	0,02/70°	14,8/124°	0,78/−17,0°
		500	0,17/ −95,0°	0,05/73°	7,3/ 97°	0,65/−20,0°
		800	0,07/−104,0°	0,07/75°	4,7/ 85°	0,62/−23,0°
		1000	0,04/−174,0°	0,09/75°	3,9/ 79°	0,61/−25,0°
		1200	0,07 + 120,0°	0,10/75°	3,3/ 73°	0,59/−28,0°
10	14	40	0,63/ −18,0°	0,01/79°	28,2/161°	0,96/ −7,2°
		200	0,34/ −63,0°	0,02/72°	15,9/119°	0,74/−17,0°
		500	0,13/ −98,0°	0,05/75°	7,5/ 95°	0,63/−19,0°
		800	0,05/−136,0°	0,07/77°	4,8/ 83°	0,61/−22,0°
		1000	0,04/+ 133,0°	0,09/76°	3,9/ 77°	0,60/−25,0°
		1200	0,08/+ 108,0°	0,10/76°	3,3/ 72°	0,58/−28,0°

Output voltage at d_{im} = −60 dB (see Figs 3 and 15)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C
$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
Measured at $f_{(p+q-r)}$ = 793,25 MHz — V_o typ. 150 mV

Second harmonic distortion (see Figs 3 and 16)
I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω; VSWR < 2; T_{amb} = 25 °C
V_p = 60 mV at f_p = 250 MHz
V_q = 60 mV at f_q = 560 MHz
measured at $f_{(p+q)}$ = 810 MHz — d_2 typ. −50 dB

→ Output power at 1 dB gain compression (see Fig. 3)
I_C = 14 mA; V_{CE} = 10 V
R_L = 75 Ω; T_{amb} = 25 °C
measured at f = 800 MHz — P_{L1} typ. 8 dBm

→ Third order intercept point (see Fig. 3)
I_C = 14 mA; V_{CE} = 10 V
R_L = 75 Ω; T_{amb} = 25 °C
P_p = ITO − 6 dB; f_p = 800 MHz
P_q = ITO − 6 dB; f_q = 801 MHz
measured at $f_{(2q-p)}$ = 802 MHz and
at $f_{(2p-q)}$ = 799 MHz — ITO typ. 27 dBm

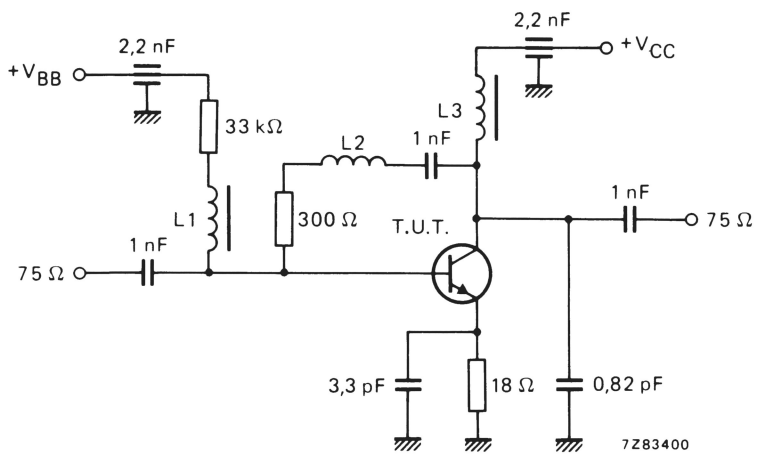


Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro choke
L2 = 3 turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

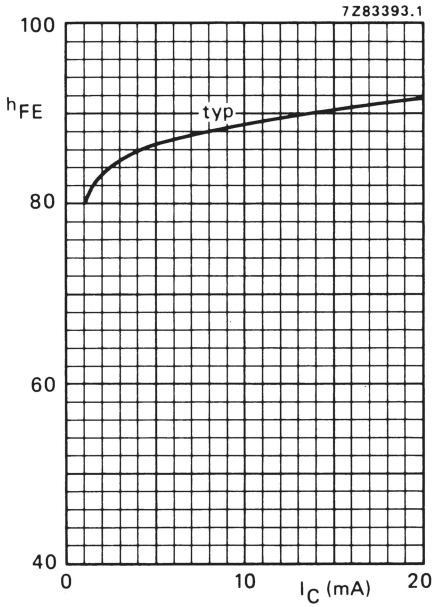


Fig. 4 V_{CE} = 10 V; T_j = 25 °C.

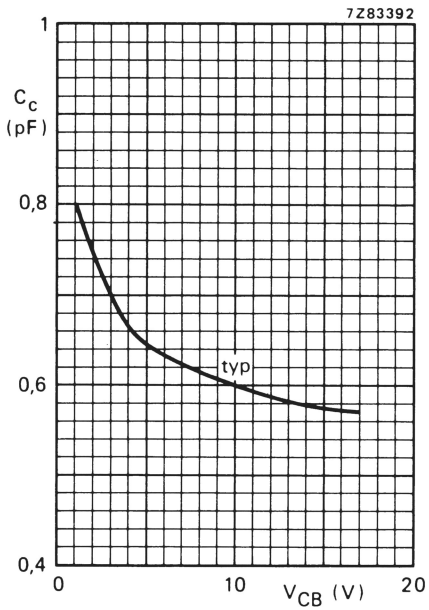


Fig. 5 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C.

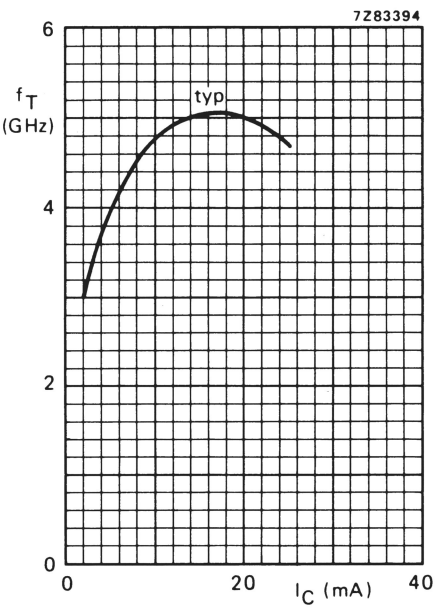


Fig. 6 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C.

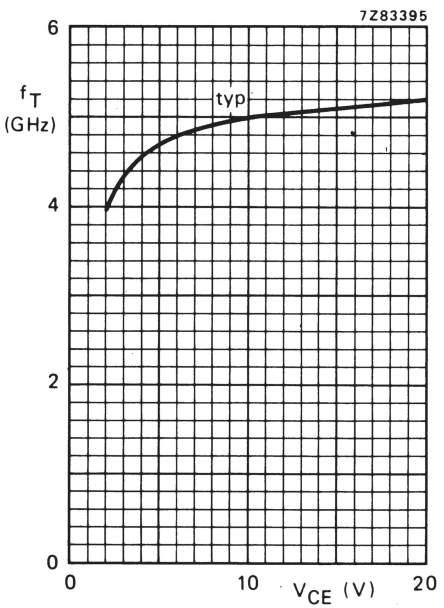


Fig. 7 I_C = 14 mA; f = 500 MHz; T_j = 25 °C.

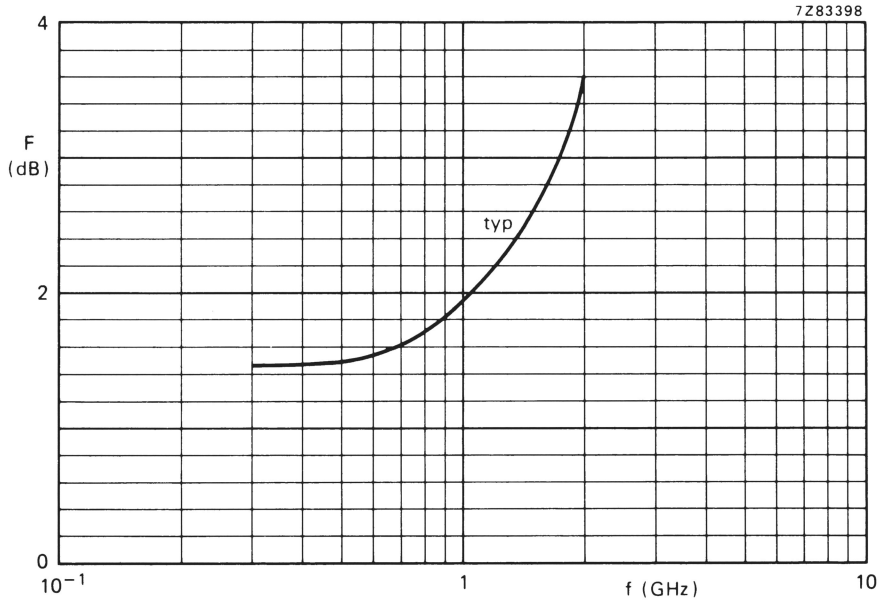


Fig. 8 V_{CE} = 10 V; I_C = 4 mA; Z_S = optimum; T_{amb} = 25 °C.

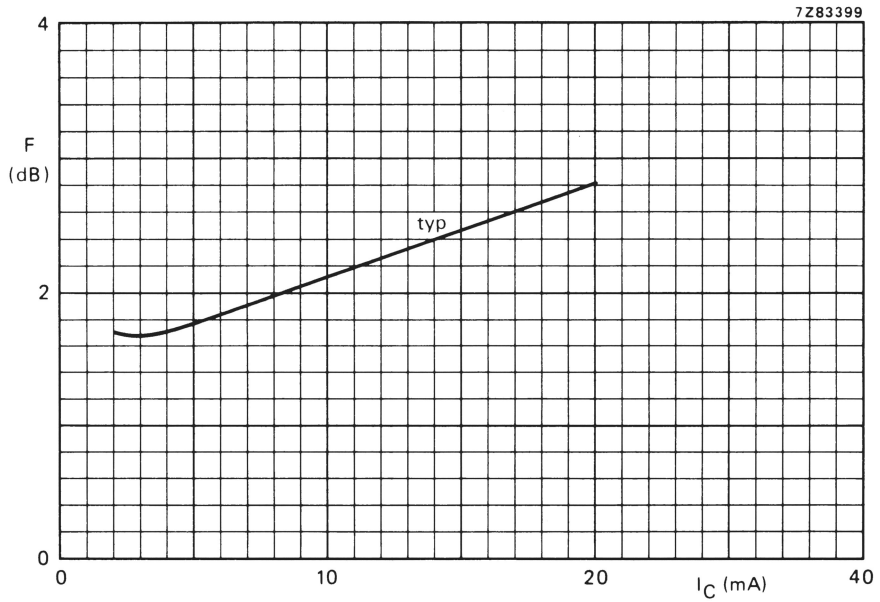


Fig. 9 V_{CE} = 10 V; f = 800 MHz; Z_S = optimum; T_{amb} = 25 °C.

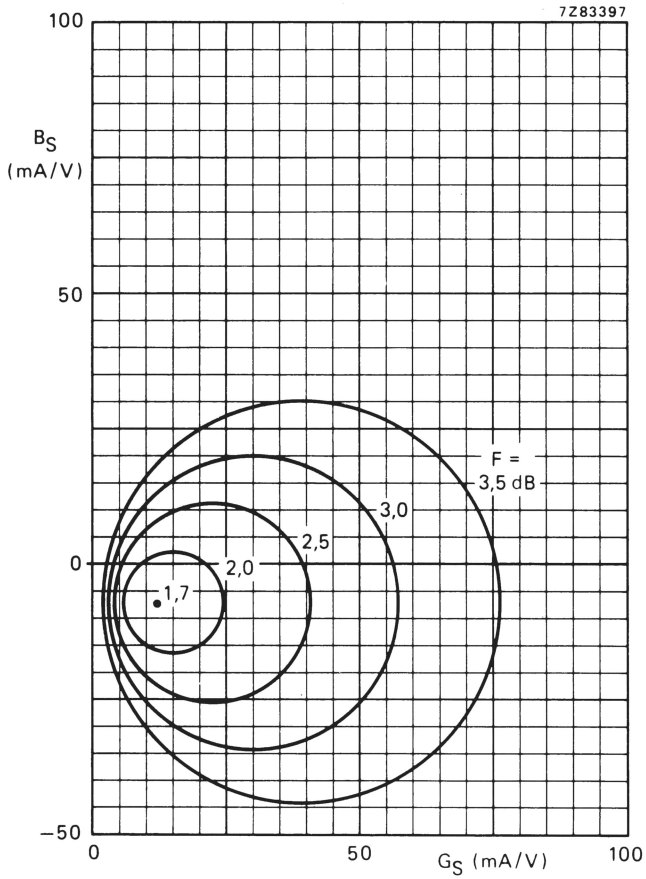


Fig. 10 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 4 mA; f = 800 MHz; T_{amb} = 25 °C; typical values.

Conditions for Figs 11 and 12:

V_{CE} = 10 V; I_C = 14 mA;
T_{amb} = 25 °C.

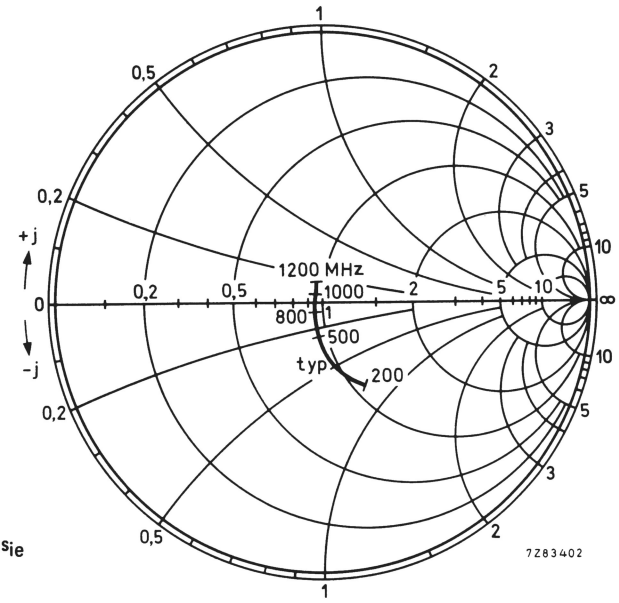


Fig. 11 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

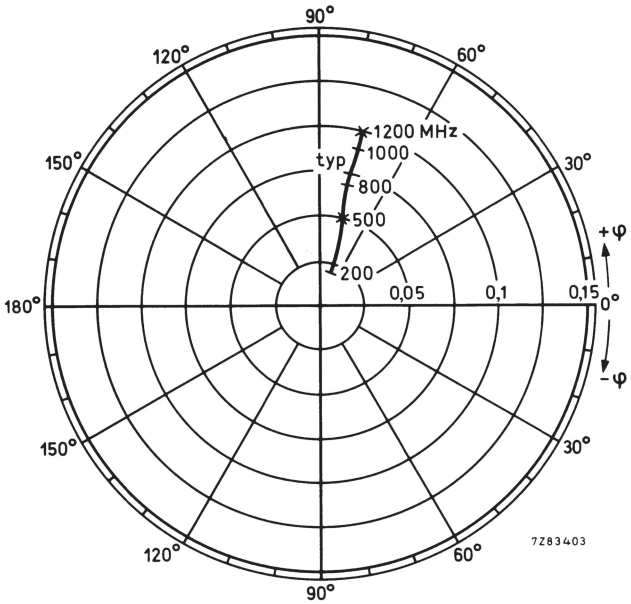


Fig. 12 Reverse transmission coefficient s_{re}.

Conditions for Figs 13 and 14:
V_{CE} = 10 V; I_C = 14 mA;
T_{amb} = 25 °C.

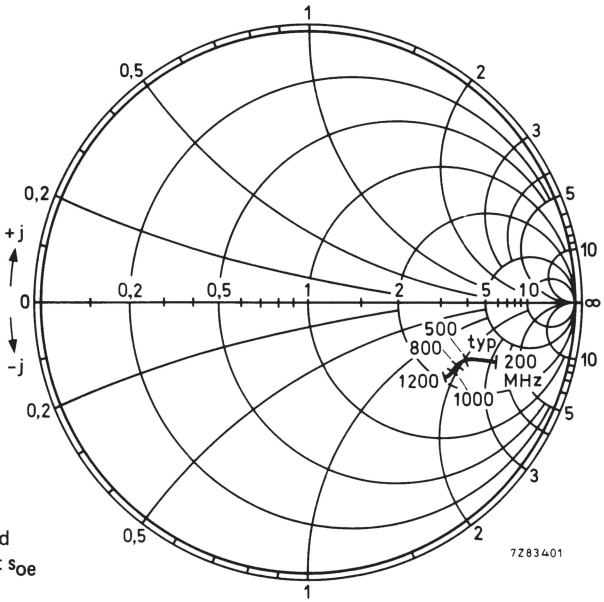


Fig. 13 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

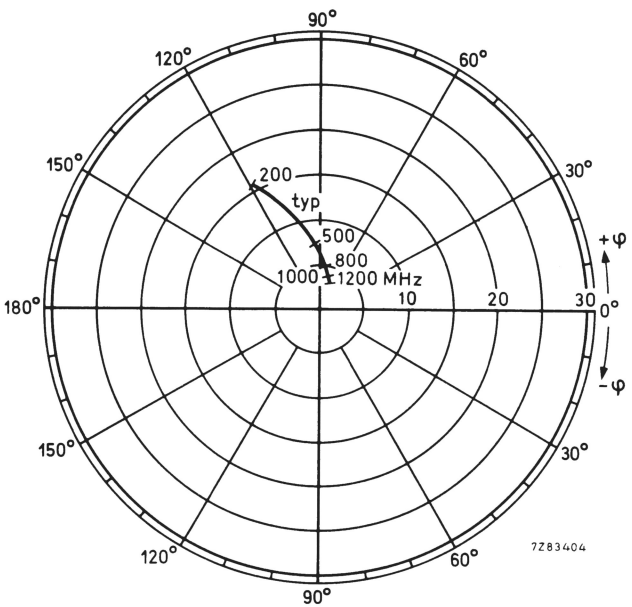


Fig. 14 Forward transmission coefficient s_{fe}.

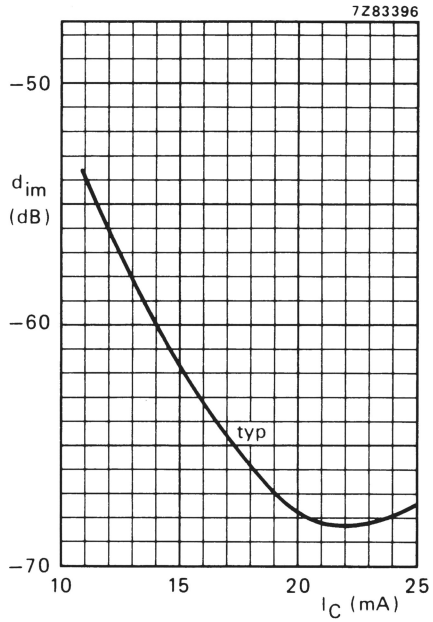


Fig. 15.

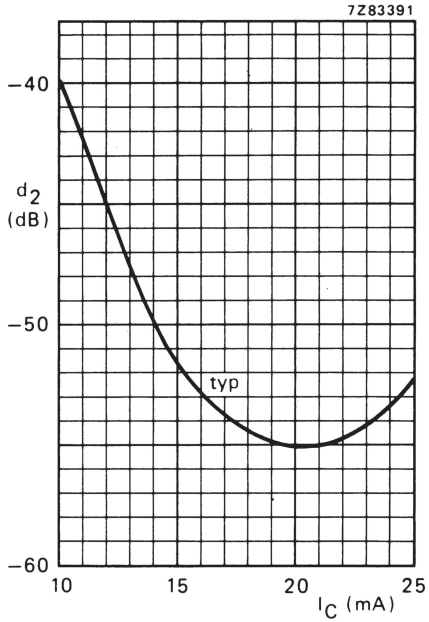


Fig. 16.

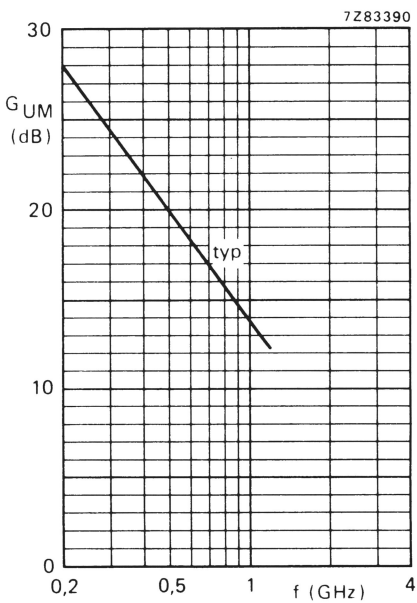


Fig. 17 V_{CE} = 10 V; I_C = 14 mA; T_{amb} = 25 °C.

Fig. 15 V_{CE} = 10 V; V_o = 43,5 dBmV = 150 mV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig. 3).

Fig. 16 V_{CE} = 10 V; V_o = 60 mV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig. 3).

CLASS-B OPERATION

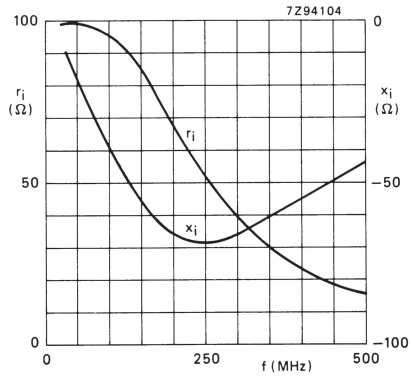


Fig. 18 Input impedance (series components).

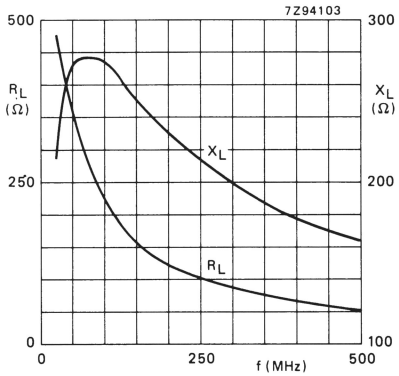


Fig. 19 Load impedance (series components).

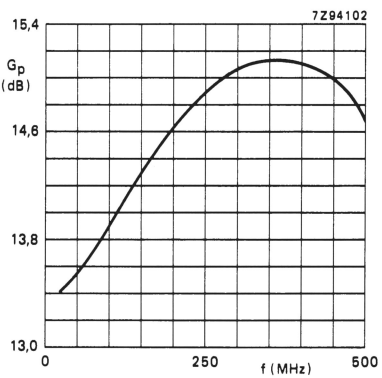


Fig. 20 Power gain versus frequency.

Conditions for Figs 18 to 20:

V_{CE} = 10 V; P_L = 100 mW; T_{amb} = 25 °C;

OPERATING NOTE for Figs 18 to 20:

A base-emitter resistor of 100 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers etc.
The transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Collector current (d.c.)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	1,9	dB
Max. unilateral power gain I_C = 30 mA; V_{CE} = 5 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	18	dB
Intermodulation distortion at T_{amb} = 25 °C I_C = 30 mA; V_{CE} = 5 V; R_L = 75 Ω; V_o = 300 mV $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ.	-60	dB

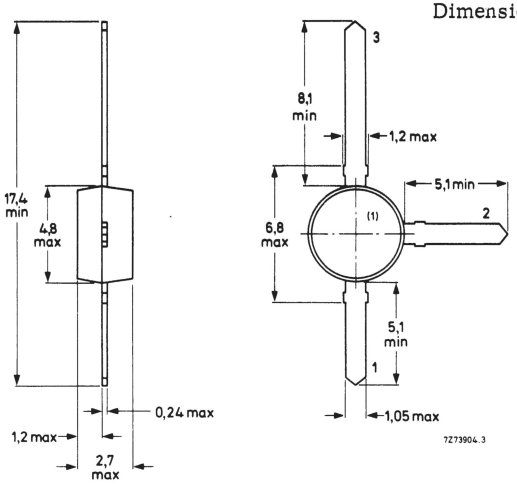
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0	V
Current				
Collector current (d.c.)	I_C	max.	35	mA
Power dissipation				
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	180	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

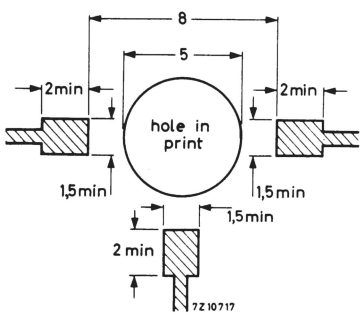
THERMAL RESISTANCE

From junction to ambient in free air

mounted on a glass-fibre print *)
of 40 mm x 25 mm x 1 mm $R_{th\ j\text{-}a}$ = 0,5 °C/mW

*) Requirements for glass-fibre print

(dimensions in mm)



CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = 5$ V	I_{CBO}	<	50	nA
D.C. current gain [1]				
$I_C = 30$ mA; $V_{CE} = 5$ V	h_{FE}	>	40	
		typ.	90	
Transition frequency at f = 500 MHz [1]				
$I_C = 30$ mA; $V_{CE} = 5$ V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	typ.	0,7	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c = 0$; $V_{EB} = 0{,}5$ V	C_e	typ.	2,5	pF
Feedback capacitance at f = 1 MHz				
$I_C = 0$; $V_{CE} = 5$ V; $T_{amb} = 25\ ^oC$	C_{re}	typ.	0,8	pF
Noise figure at optimum source impedance				
$I_C = 2$ mA; $V_{CE} = 5$ V; f = 500 MHz; $T_{amb} = 25\ ^oC$	F	typ.	1,9	dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

$I_C = 30$ mA; $V_{CE} = 5$ V; f = 500 MHz; $T_{amb} = 25\ ^oC$	G_{UM}	typ.	18	dB

[1]) Measured under pulse conditions.

CHARACTERISTICS (continued)

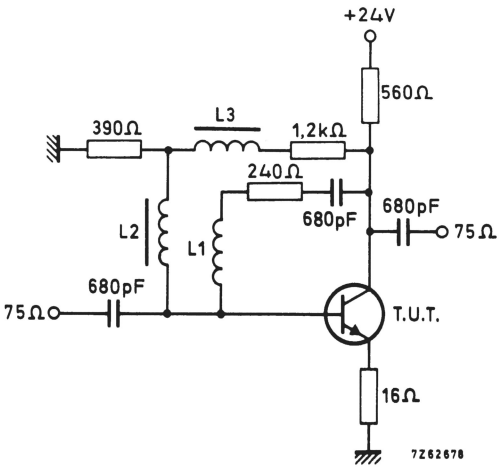
Intermodulation distortion at T_{amb} = 25 °C

I_C = 30 mA; V_{CE} = 5 V; R_L = 75 Ω; V.S.W.R. < 2

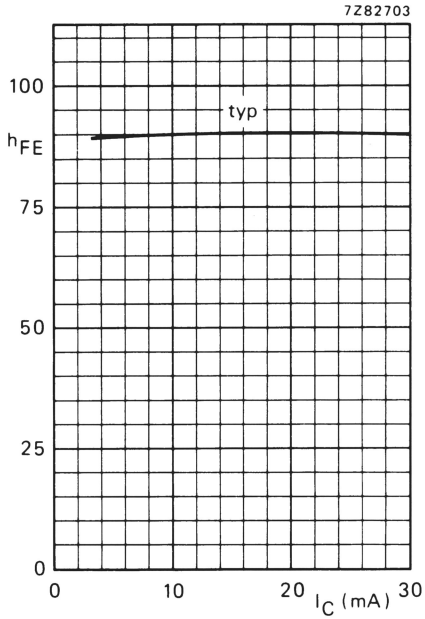
$V_p = V_o$ = 300 mV at f_p = 495,25 MHz
$V_q = V_o$ −6 dB at f_q = 503,25 MHz
$V_r = V_o$ −6 dB at f_r = 505,25 MHz

Measured at $f_{(p+q-r)}$ = 493,25 MHz d_{im} typ. −60 dB

Intermodulation test circuit:



L1 = 4 turns Cu wire (0,35); winding pitch 1 mm; int. diam. 4 mm
L2 and L3 5 μH (code number: 3122 108 20150)



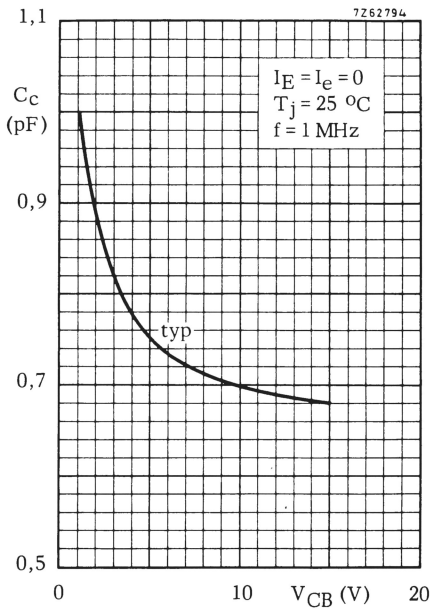
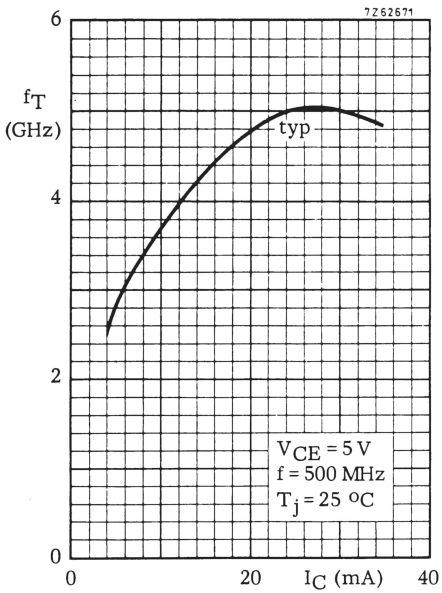
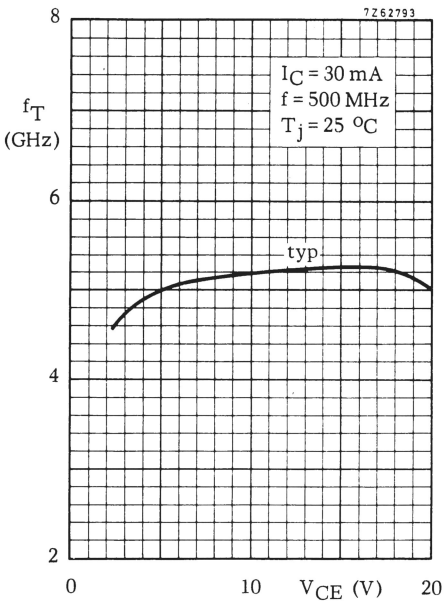
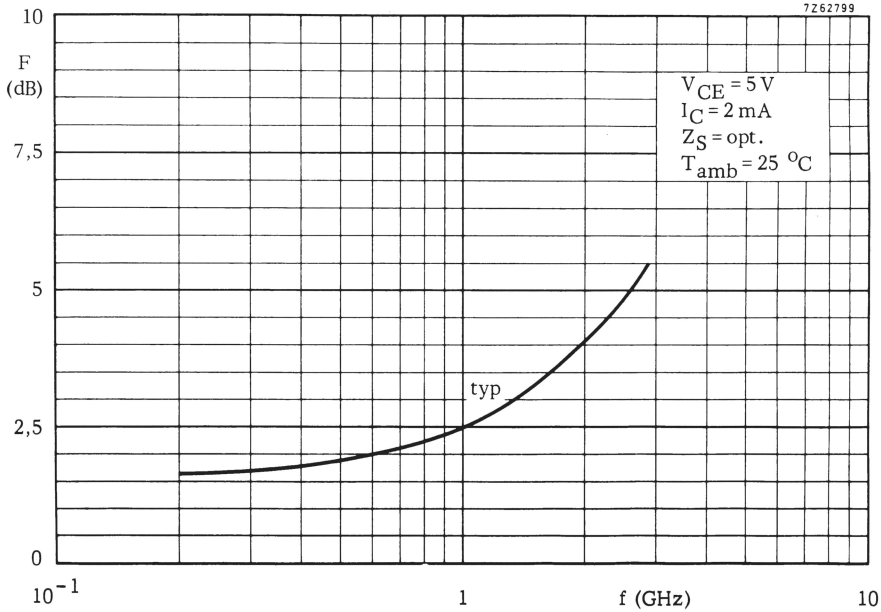
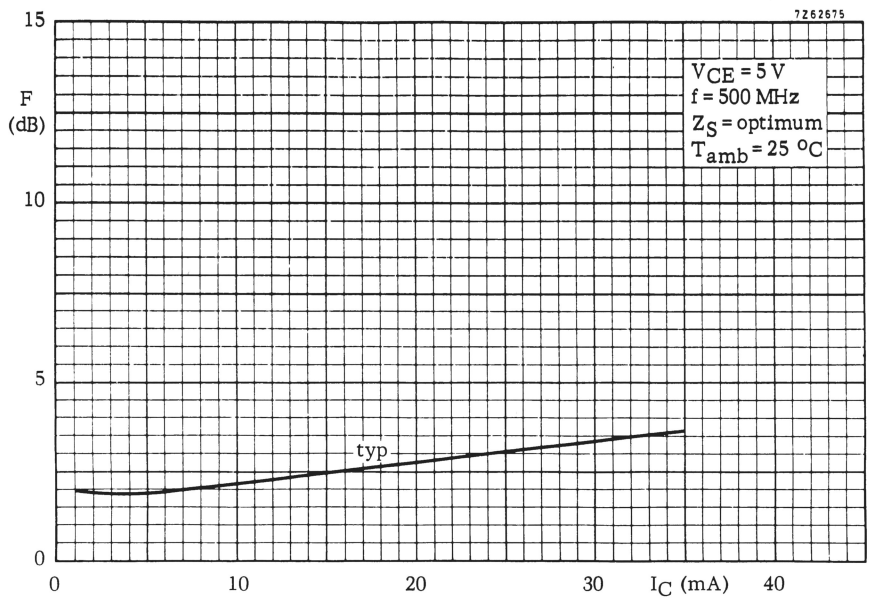


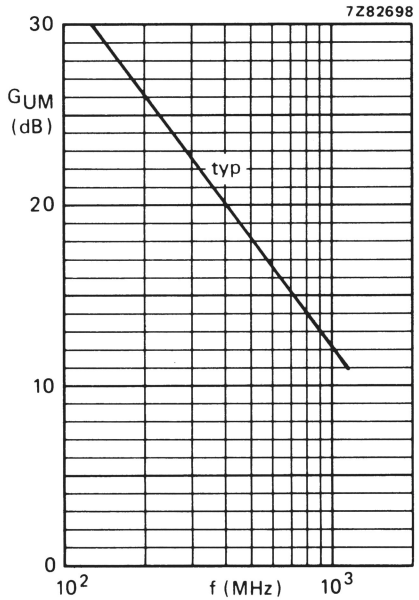
Fig. 4 V_{CE} = 5 V; T_j = 25 °C.






7Z62799
10
F
(dB)
7,5
5
2,5
0
10^{-1}
1
f (GHz)
10
typ
V_{CE} = 5 V
I_C = 2 mA
Z_S = opt.
T_{amb} = 25 °C


7Z62675
15
F
(dB)
10
5
0
0
10
20
30
I_C (mA)
40
typ
V_{CE} = 5 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C



circles of constant noise figure

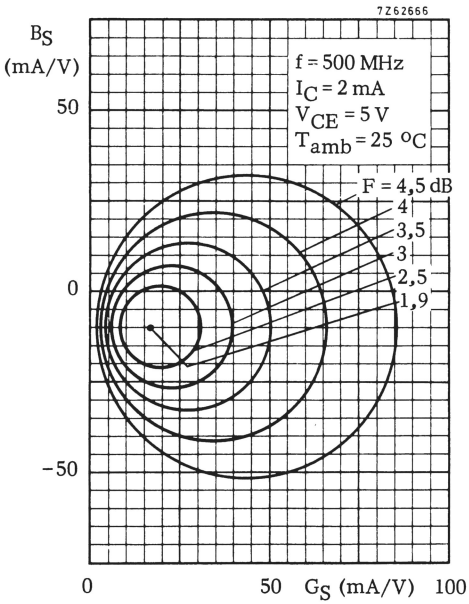


Fig. 10 V_{CE} = 5 V; I_C = 30 mA; T_{amb} = 25 °C.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package primarily intended for use in u.h.f. and microwave amplifiers.

Features of this product:

- low noise;
- very low intermodulation distortion;
- high power gain;
- gold metallization.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	15	V
Collector-emitter voltage (open base)	V_{CEO}	max.	12	V
Collector current (d.c.)	I_C	max.	35	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,6	pF
Noise figure at optimum source impedance I_C = 4 mA; V_{CE} = 8 V; f = 800 MHz	F	typ.	1,6	dB
Maximum unilateral power gain I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	14	dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	425	mV
Output power at 1 dB gain compression	P_{L1}	typ.	+ 17	dBm ←
Third order intercept point	ITO	typ.	+ 36	dBm ←

MECHANICAL DATA

SOT-37 (see Fig. 1).

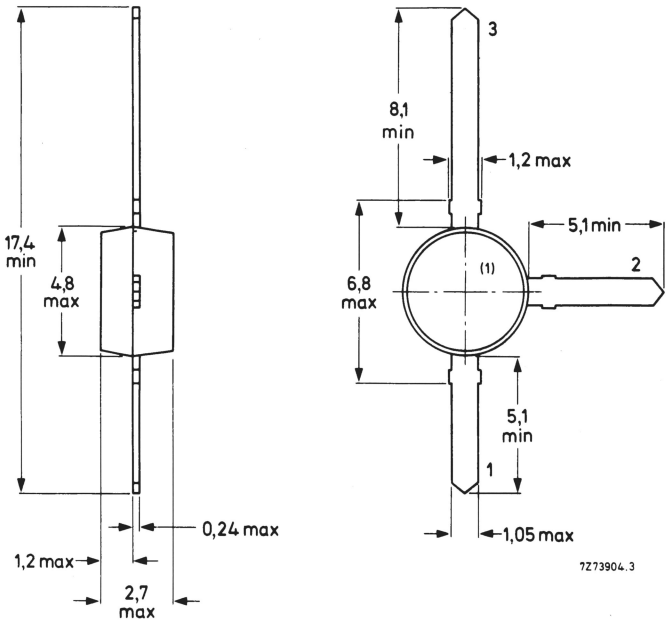
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	15 V
Collector-emitter voltage (open base)	V_{CEO}	max.	12 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,0 V
Collector current (d.c.)	I_C	max.	35 mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	300 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	300 K/W

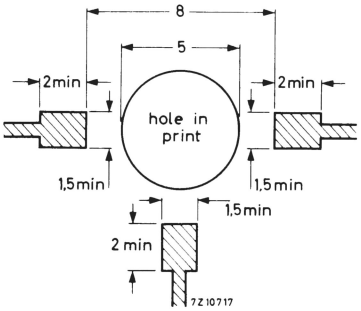


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.)

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50 nA
D.C. current gain*			
I_C = 30 mA; V_{CE} = 5 V	h_{FE}	>	40
		typ.	90
Transition frequency at f = 500 MHz*			
I_C = 30 mA; V_{CE} = 5 V	f_T	typ.	6 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 5 V	C_c	typ.	0,9 pF
Emitter capacitance at f = 1 MHz			
$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	2,5 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,6 pF
Noise figure at optimum source impedance			
I_C = 4 mA; V_{CE} = 8 V; f = 800 MHz	F	typ.	1,6 dB
I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz	F	typ.	2,3 dB
Maximum unilateral power gain (s_{re} assumed to be zero)			
G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)\,(1-\lvert s_{oe}\rvert^2)}$			
I_C = 30 mA; V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	14 dB

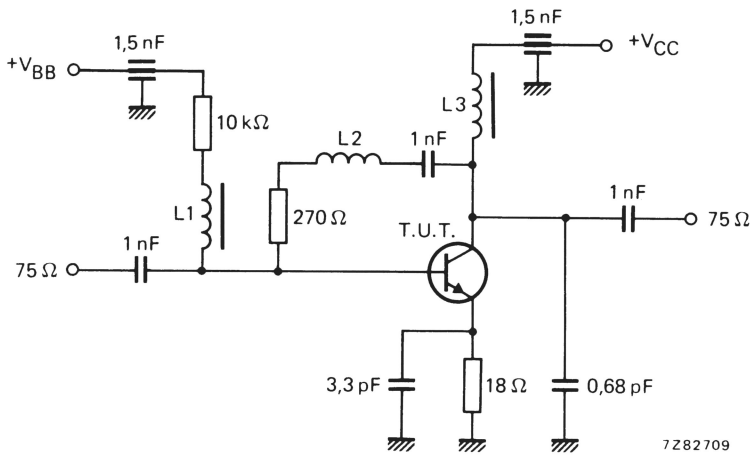
* Measured under pulse conditions.

Output voltage at d_{im} = −60 dB (see Figs 3 and 14)
(DIN 45004B, par. 6.3: 3-tone)
I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C
$V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz
$V_q = V_o$ −6 dB ; f_q = 803,25 MHz
$V_r = V_o$ −6 dB ; f_r = 805,25 MHz
Measured at $f_{(p+q-r)}$ = 793,25 MHz — V_o typ. 425 mV

Output voltage at d_2 = −50 dB (see Figs 3 and 15)
I_C = 30 mA; V_{CE} = 8 V; R_L = 75 Ω; T_{amb} = 25 °C
$V_p = V_o$ at d_2 = −50 dB; f_p = 250 MHz
$V_q = V_o$ at d_2 = −50 dB; f_q = 560 MHz
measured at $f_{(p+q)}$ = 810 MHz — V_o typ. 200 mV

→ Output power at 1 dB gain compression (see Fig. 3)
I_C = 30 mA; V_{CE} = 8V
R_L = 75 Ω; T_{amb} = 25 °C — P_{L1} typ. + 17 dBm
measured at f = 800 MHz

→ Third order intercept point (see Fig. 3)
I_C = 30 mA; V_{CE} = 8 V
R_L = 75 Ω; T_{amb} = 25 °C
P_P = ITO − 6 dB; f_p = 800 MHz
P_q = ITO − 6 dB; f_q = 801 MHz
measured at $f_{(2q-p)}$ = 802 MHz and
at $f_{(2p-q)}$ = 799 MHz — ITO typ. + 36 dBm



→ Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro choke
L2 = 3 turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

s-parameters (common emitter) at V_{CE} = 8 V.

The figures given in the tables below can also be used for operation at V_{CE} = 5 V. Only slight differences for the s-parameters may occur.

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
	40	0,89/ −12,9°	0,01/75°	9,5/166°	0,97/ −6,1°
	100	0,85/ −30,7°	0,03/70,6°	8,7/155°	0,94/−13,5°
	200	0,75/ −57,1°	0,05/61,5°	7,4/138°	0,87/−22,5°
2	500	0,48/−113°	0,08/50,9°	4,4/106°	0,72/−34,2°
	800	0,37/−153°	0,09/51,9°	3,0/ 86,3°	0,64/−40,0°
	1000	0,34/−178°	0,10/55,0°	2,6/ 77,0°	0,61/−47,8°
	1200	0,34/+ 159°	0,11/58,5°	2,2/ 68,0°	0,58/−53,9°
	40	0,79/ −18,4°	0,01/74°	17,8/162°	0,94/ −9,1°
	100	0,71/ −42,1°	0,03/67,1°	15,2/146°	0,87/−19,5°
	200	0,57/ −72,8°	0,04/60,0°	11,5/126°	0,75/−28,7°
5	500	0,31/−127°	0,07/60,1°	5,8/ 98,2°	0,59/−36,1°
	800	0,25/−168°	0,09/63,6°	3,8/ 82,0°	0,54/−41,0°
	1000	0,25/+ 165°	0,11/65,2°	3,2/ 74,4°	0,51/−46,7°
	1200	0,26/+ 141°	0,13/66,1°	2,7/ 66,7°	0,49/−52,2°
	40	0,67/ −25,3°	0,01/71°	27,9/156°	0,90/−12,8°
	100	0,55/ −55,1°	0,02/65,1°	21,8/136°	0,78/−25,6°
	200	0,40/ −88,2°	0,04/62,4°	14,7/116°	0,62/−33,4°
10	500	0,20/−141°	0,06/68,3°	6,7/ 93,0°	0,51/−35,9°
	800	0,16/+ 177°	0,09/70,0°	4,3/ 79,3°	0,48/−40,3°
	1000	0,18/+ 151°	0,12/69,7°	3,5/ 72,5°	0,46/−44,2°
	1200	0,21/+ 130°	0,14/68,9°	3,0/ 65,1°	0,43/−50,7°
	40	0,51/ −34,7°	0,01/69°	39,7/149°	0,84/−17,4°
	100	0,38/ −70,5°	0,02/65,8°	27,7/126°	0,66/−29,5°
20	200	0,26/−104°	0,03/68,0°	16,8/109°	0,51/−32,5°
	500	0,16/−158°	0,06/74,0°	7,3/ 89,3°	0,45/−33,4°
	800	0,14/+ 155°	0,10/73,6°	4,6/ 77,5°	0,42/−39,1°
	1000	0,17/+ 133°	0,12/72,3°	3,8/ 71,2°	0,41/−43,6°
	1200	0,21/+ 115°	0,14/70,5°	3,2/ 64,4°	0,39/−51,0°
	40	0,46/ −36,5°	0,01/73°	43,3/150°	0,87/−16,9°
	100	0,32/ −73,7°	0,02/69,2°	29,1/124°	0,66/−27,2°
	200	0,20/−109°	0,03/72,0°	17,1/106°	0,50/−28,1°
30	500	0,14/−174°	0,06/75,6°	7,4/ 87,2°	0,41/−31,7°
	800	0,15/+ 143°	0,10/74,7°	4,8/ 74,9°	0,39/−41,0°
	1000	0,17/+ 124°	0,12/72,9°	3,9/ 70,5°	0,38/−42,8°
	1200	0,21/+ 111°	0,15/71,0°	3,3/ 63,8°	0,37/−51,0°

Conditions for Figs 4 and 5:

V_{CE} = 8 V; I_C = 30 mA;
T_{amb} = 25 °C.

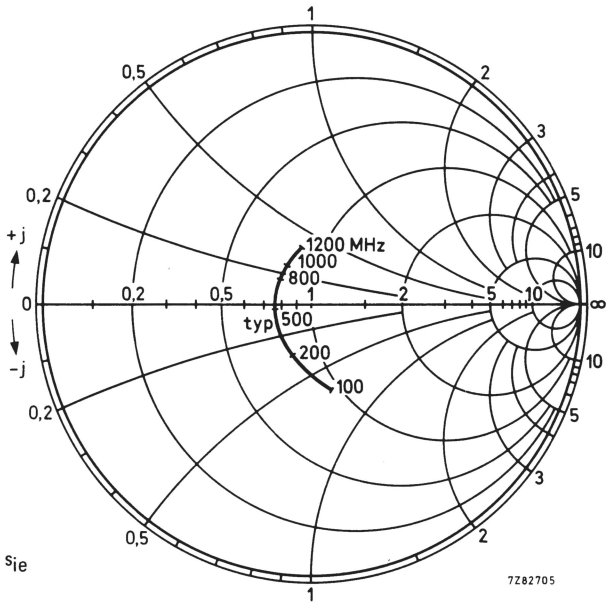


Fig. 4 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

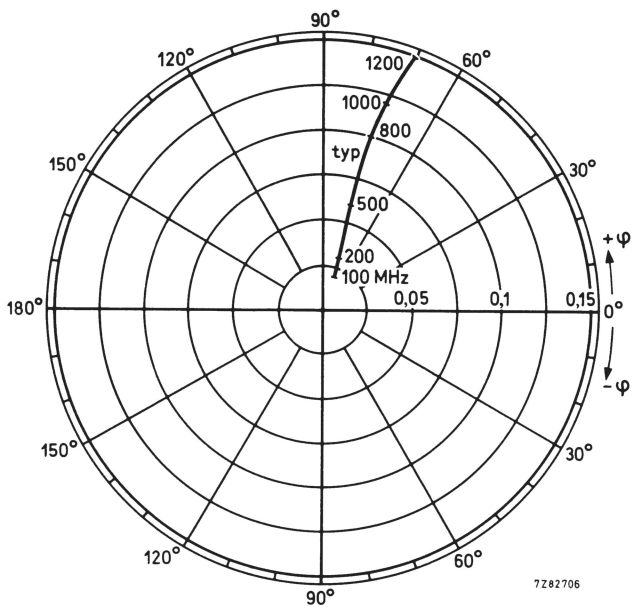


Fig. 5 Reverse transmission coefficient s_{re}.

Conditions for Figs 6 and 7:
V_{CE} = 8 V; I_C = 30 mA;
T_{amb} = 25 °C.

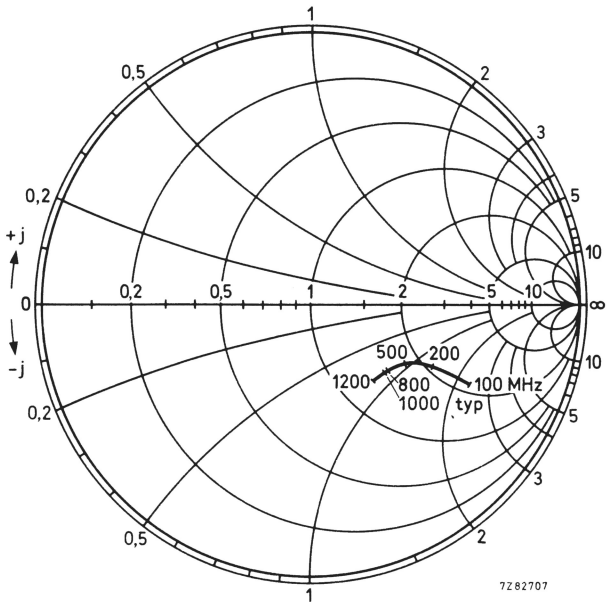


Fig. 6 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

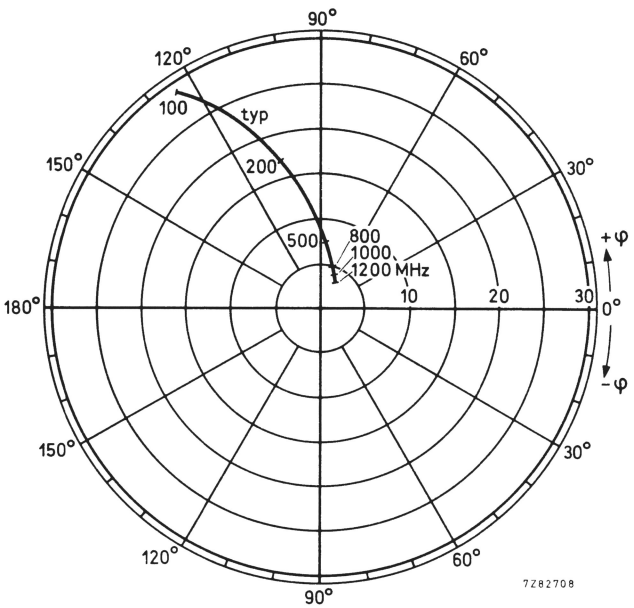


Fig. 7 Forward transmission coefficient s_{fe}.

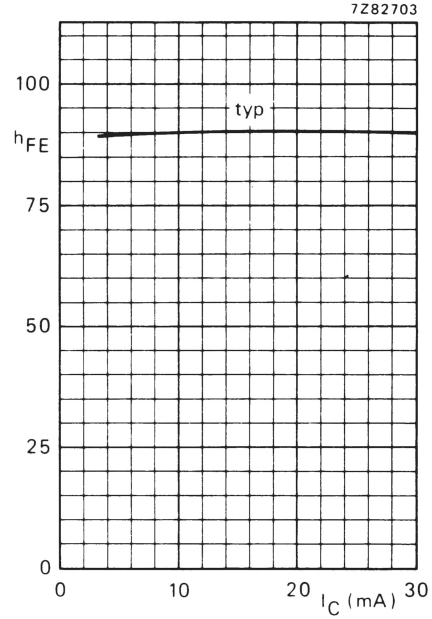


Fig. 8 V_{CE} = 5 V; T_j = 25 °C.

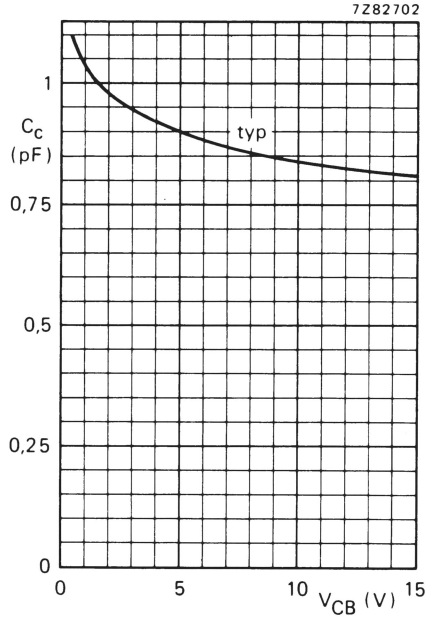


Fig. 9 $I_E = I_e$ = 0; f = 1 MHz; T_j = 25 °C.

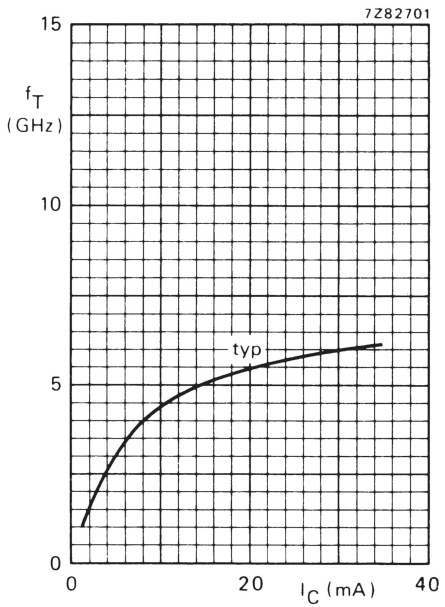


Fig. 10 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

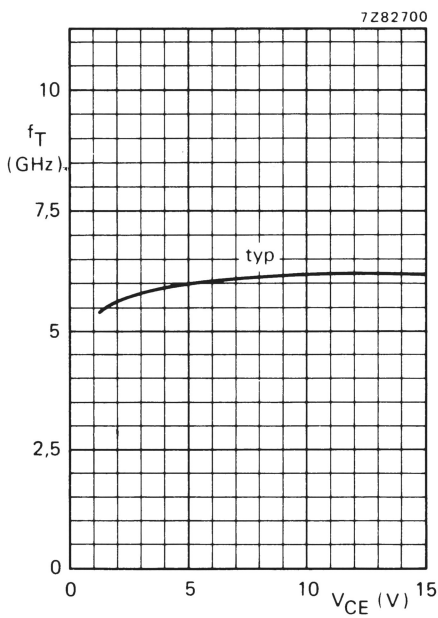


Fig. 11 I_C = 30 mA; f = 500 MHz; T_j = 25 °C.

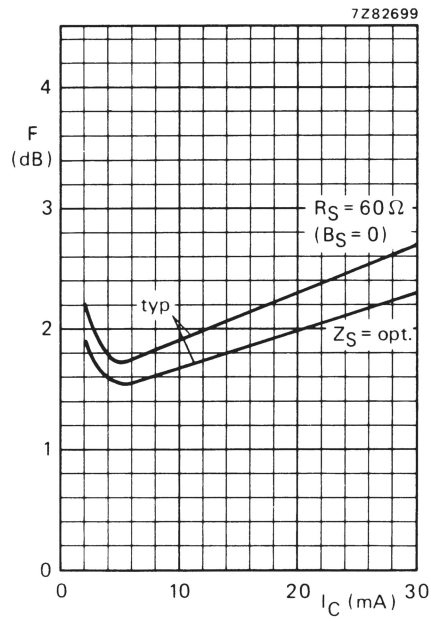


Fig. 12 V_{CE} = 8 V; f = 800 MHz; T_{amb} = 25 °C.

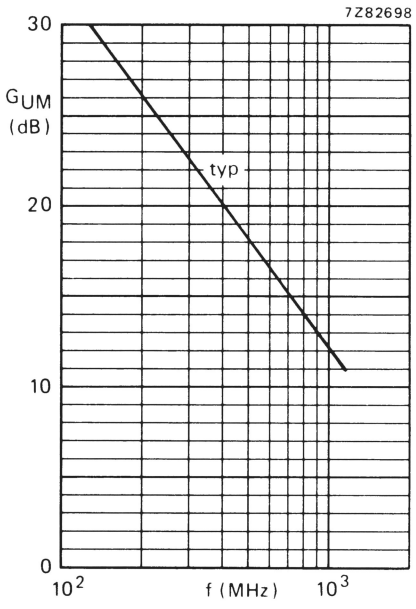


Fig. 13 V_{CE} = 8 V; I_C = 30 mA; T_{amb} = 25 °C.

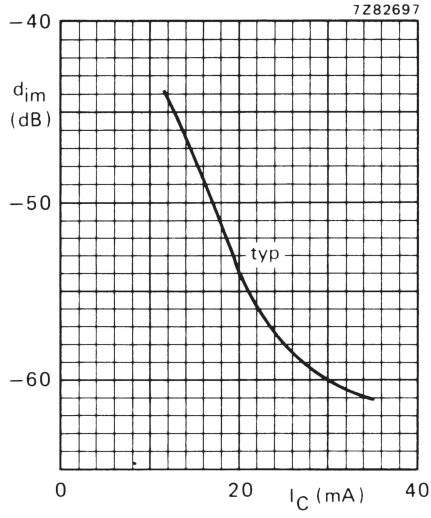


Fig. 14 V_{CE} = 8 V; V_o = 425 mV = 52,6 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig. 3).

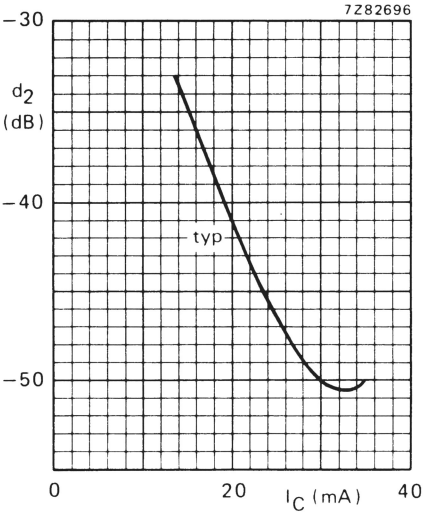


Fig. 15 V_{CE} = 8 V; V_o = 200 mV = 46 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C; measured in test circuit (see Fig. 3).

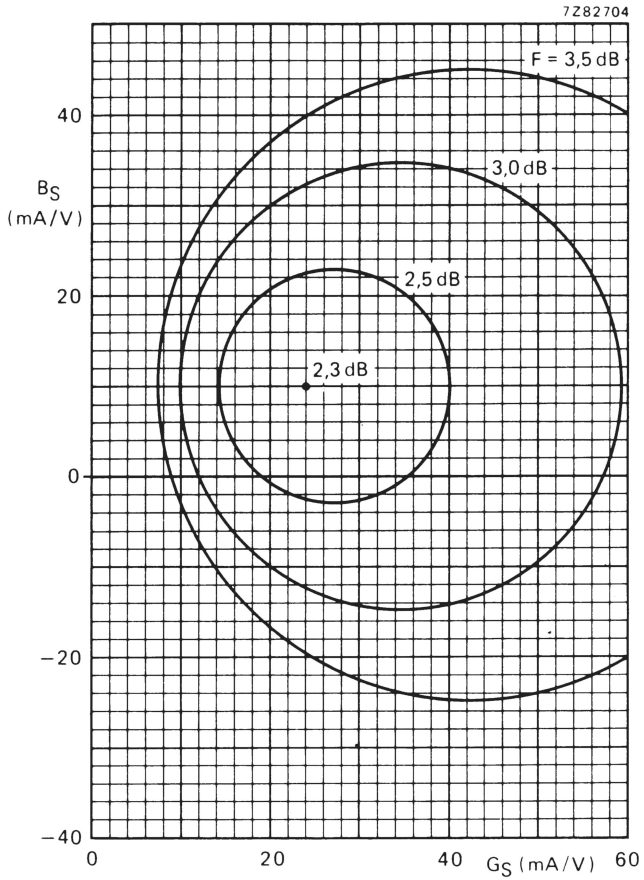


Fig. 16 Circles of constant noise figure.
V_{CE} = 8 V; I_C = 30 mA; f = 800 MHz;
T_{amb} = 25 °C; typical values.

CLASS-B OPERATION

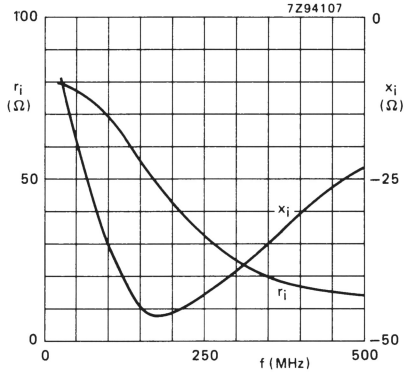


Fig. 17 Input impedance (series components).

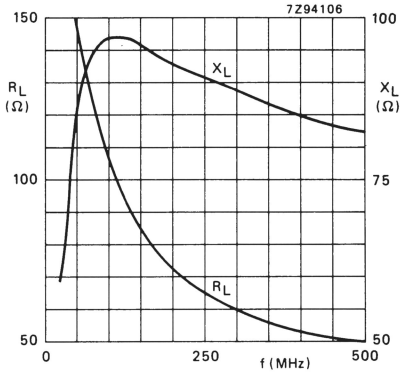


Fig. 18 Load impedance (series components).

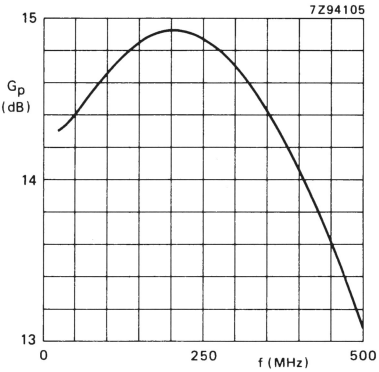


Fig. 19 Power gain versus frequency.

Conditions for Figs 17 to 19:

V_{CE} = 7,5 V; P_L = 160 mW; T_{amb} = 25 °C;

OPERATING NOTE for Figs 17 to 19:

A base-emitter resistor of 82 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N resistance-stabilized transistor in a SOT-48 capstan envelope featuring extremely low cross modulation, intermodulation and second harmonic distortion. Thanks to its high transition frequency it has a high power gain in conjunction with good wideband properties and low noise up to high frequencies.

It is primarily intended for CATV and MATV applications.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_h = 145 °C; f > 1 MHz	P_{tot}	max.	3,5 W
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 90 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
Cross modulation distortion (channel 13) I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ. <	−61 dB −57 dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ. <	−93 dB −89 dB
Intermodulation distortion at $f_{(p+q-r)}$ = 194,25 MHz I_C = 90 mA; V_{CE} = 20 V; V_o = 60 dBmV	d_{im}	typ.	−63 dB
Broadband power gain I_C = 90 mA; V_{CE} = 20 V	G_p	> typ.	10 dB 11 dB
Noise figure at f = 200 MHz I_C = 90 mA; V_{CE} = 20 V	F	typ. <	8 dB 10 dB
2nd harmonic distortion at $f_p + f_q$ = 210 MHz I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_2	<	−56 dB

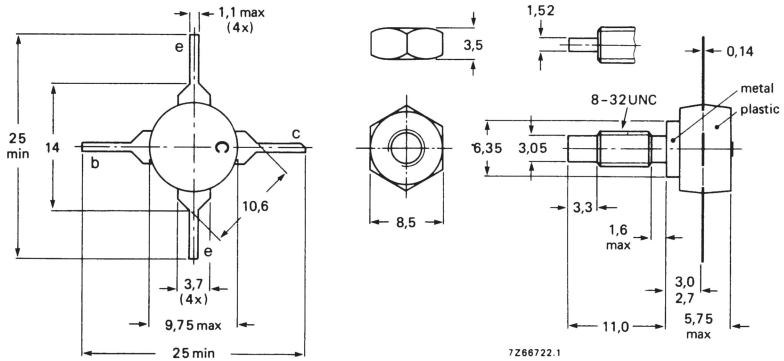
MECHANICAL DATA (see next page)

PRODUCT SAFETY. These devices incorporate beryllium oxide, the dust of which is toxic. The devices are entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

SOT-48



When locking is required an adhesive instead of a lock washer is preferred.

Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,17 mm.
Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	35	V
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V

Currents

Collector current (d.c.)	I_C	max.	150	mA
Collector current (peak value); f > 1 MHz	I_{CM}	max.	300	mA

Power dissipation

Total power dissipation (d.c.) up to T_h = 160 °C	P_{tot}	max.	2,5	W
Total power dissipation up to T_h = 145 °C; f > 1 MHz	P_{tot}	max.	3,5	W

Temperatures

Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15	°C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	°C/W

CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified

Collector cut-off current					
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	50	μA	
D.C. current gain					
$I_C = 50$ mA; $V_{CE} = 20$ V	h_{FE}	>	30		1)
$I_C = 150$ mA; $V_{CE} = 20$ V	h_{FE}	>	30		1)
Transition frequency at f = 500 MHz					
$I_C = 90$ mA; $V_{CE} = 20$ V	f_T	typ.	3,5	GHz	1)
$I_C = 150$ mA; $V_{CE} = 20$ V	f_T	typ.	3,5	GHz	1)
Collector capacitance at f = 1 MHz					
$I_E = I_e = 0$; $V_{CB} = 20$ V	C_c	typ.	3,5	pF	
Emitter capacitance at f = 1 MHz					
$I_C = I_c = 0$; $V_{EB} = 0,5$ V	C_e	typ.	12	pF	
Feedback capacitance at f = 1 MHz					
$I_C = 10$ mA; $V_{CE} = 20$ V	C_{re}	typ.	1,3	pF	
Collector-stud capacitance at f = 1 MHz	C_{cs}	typ.	2	pF	
Noise figure at optimum source impedance					
$I_C = 90$ mA; $V_{CE} = 20$ V; f = 500 MHz; $T_{amb} = 25\ ^oC$	F	typ.	5	dB	1)
Max. unilateral power gain (s_{re} assumed to be zero)					
G_{UM} (in dB) $= 10 \log \frac{\lvert s_{fe} \rvert^2}{(1 - \lvert s_{ie} \rvert^2)(1 - \lvert s_{oe} \rvert^2)}$					
$I_C = 90$ mA; $V_{CE} = 20$ V; f = 500 MHz; $T_{amb} = 25\ ^oC$	G_{UM}	typ.	13,5	dB	

1) Measured under pulse conditions.

CHARACTERISTICS (continued)

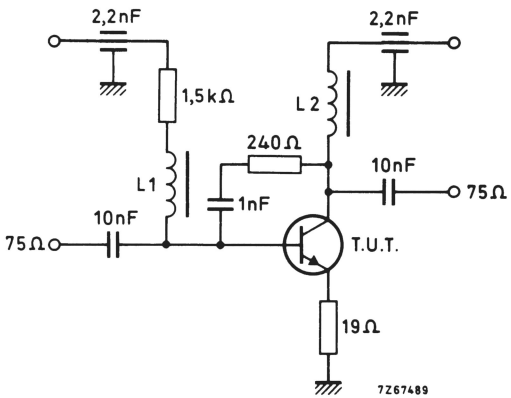
Intermodulation distortion at T_{amb} = 25 °C

I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω

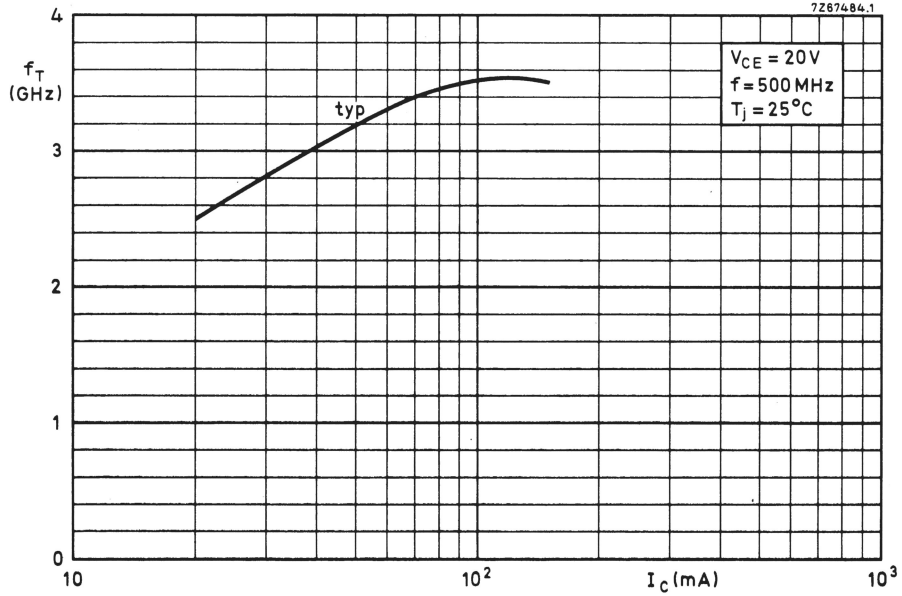
$V_p = V_o$ = 700 mV at f_p = 495,25 MHz
$V_q = V_o$ −6 dB at f_q = 503,25 MHz
$V_r = V_o$ −6 dB at f_r = 505,25 MHz

Measured at $f_{(p+q-r)}$ = 493,25 MHz d_{im} typ. −60 dB

MATV test circuit



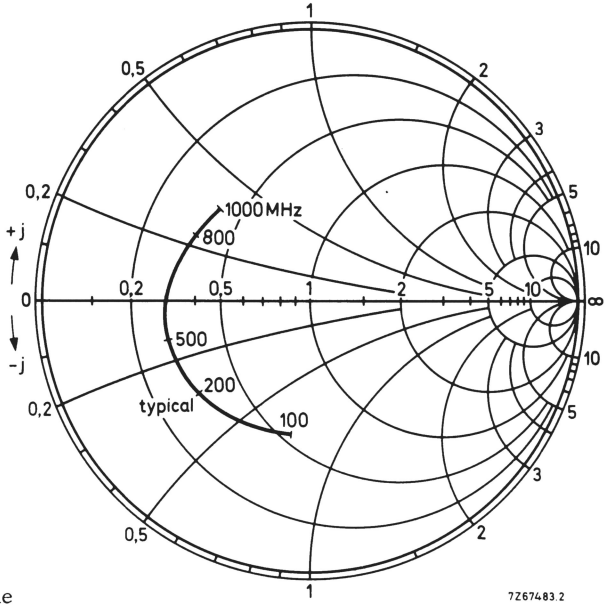
L1 = L2 = 5 μH ferroxcube coil (code number: 3122 108 20153)


7Z67484.1
4
3
2
1
0
f_T (GHz)
typ
V_{CE} = 20 V
f = 500 MHz
T_j = 25 °C
10
10^2
I_C (mA)
10^3

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C

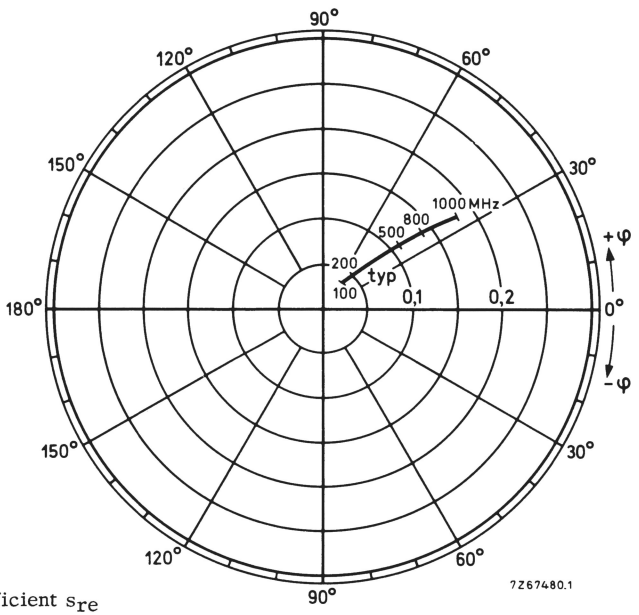


Input reflection coefficient s_{ie}

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C

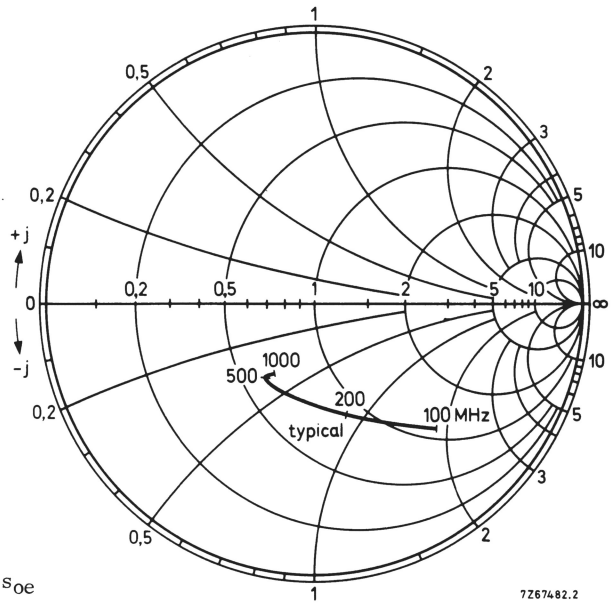


Reverse transmission coefficient s_{re}

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C

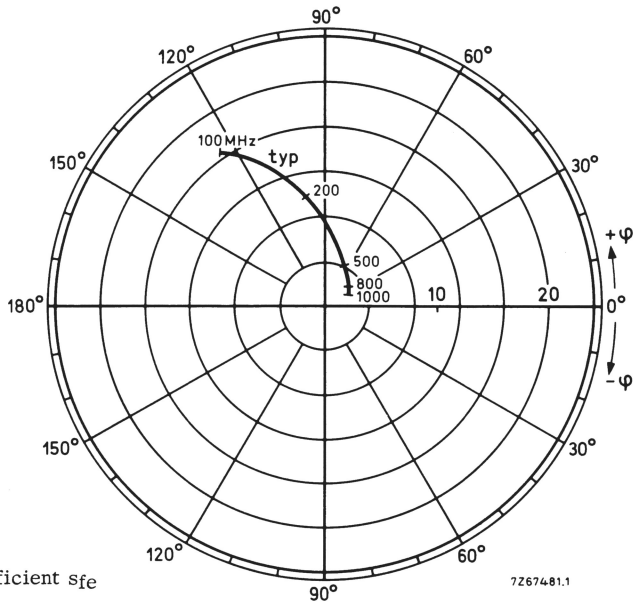


Output reflection coefficient s_{oe}

V_{CE} = 20 V

I_C = 90 mA

T_{amb} = 25 °C



Forward transmission coefficient s_{fe}

APPLICATION INFORMATION

T_{amb} = 25 °C unless otherwise specified

Cross modulation distortion (channel 13) [1]

I_C = 90 mA; V_{CE} = 20 V; V_o = 48 dBmV	d_{cm}	typ.	−61	dB
		<	−57	dB
I_C = 90 mA; V_{CE} = 20 V; V_o = 32 dBmV	d_{cm}	typ.	−93	dB
		<	−89	dB

Intermodulation distortion

I_C = 90 mA; V_{CE} = 20 V; R_L = 75 Ω

$V_p = V_o$ = 60 dBmV at f_p = 196,25 MHz
$V_q = V_o$ −6 dB at f_q = 203,25 MHz
$V_r = V_o$ −6 dB at f_r = 205,25 MHz

Measured at $f_{(p+q-r)}$ = 194,25 MHz	d_{im}	typ.	−63	dB

Broadband power gain

I_C = 90 mA; V_{CE} = 20 V	G_p	>	10	dB
		typ.	11	dB

Noise figure

I_C = 90 mA; V_{CE} = 20 V; f = 200 MHz	F	typ.	8	dB
		<	10	dB

2nd harmonic distortion

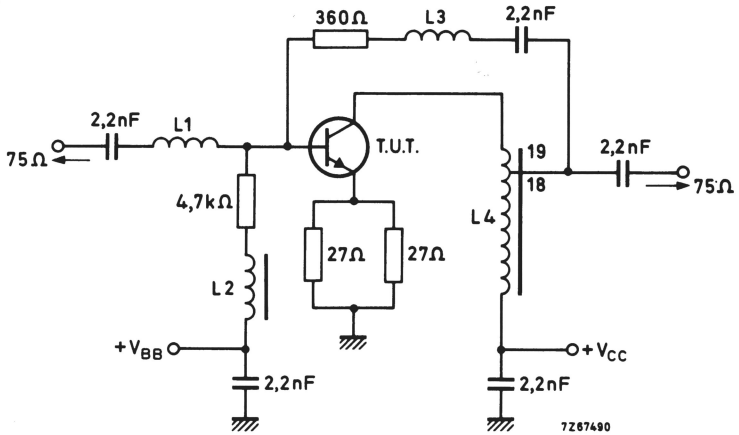
I_C = 90 mA; V_{CE} = 20 V

f_p = 66 MHz; f_q = 144 MHz; $f_p + f_q$ = 210 MHz; V_o = 48 dBmV	d_2	<	−56	dB

1) In 12-channel measuring equipment; channel 13 unmodulated.
V_o = output level/signal, according to NCTA measuring standard.

APPLICATION INFORMATION (continued)

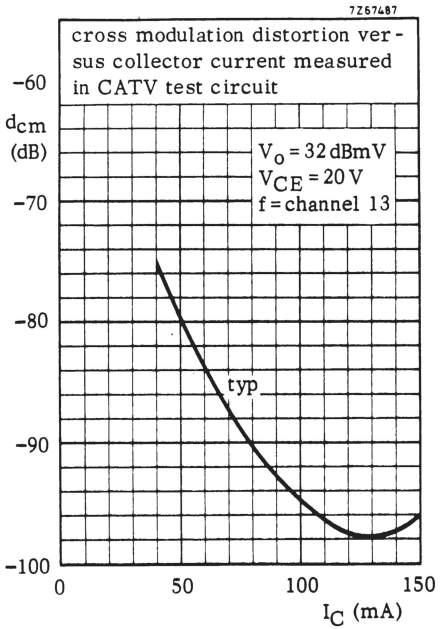
CATV test circuit

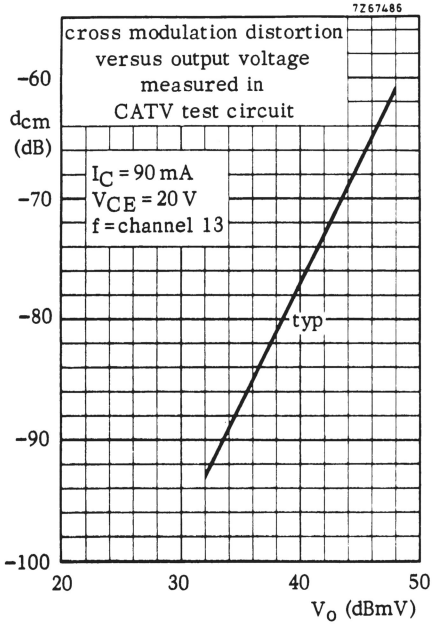


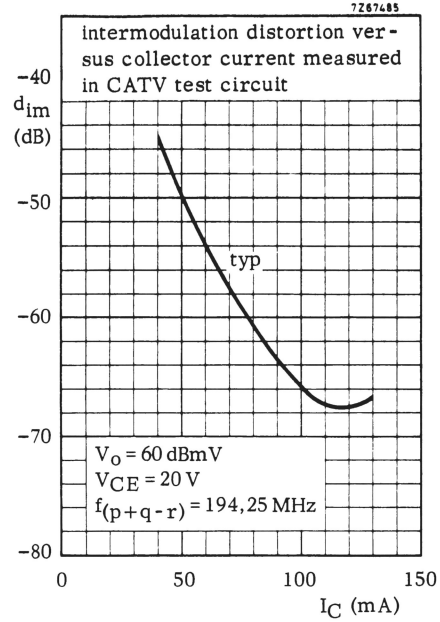
Frequency range 40 to 300 MHz (flatness gain ±0,2 dB)			
Return losses input and output		<	−16 dB
Power gain	G_p	typ.	11 dB

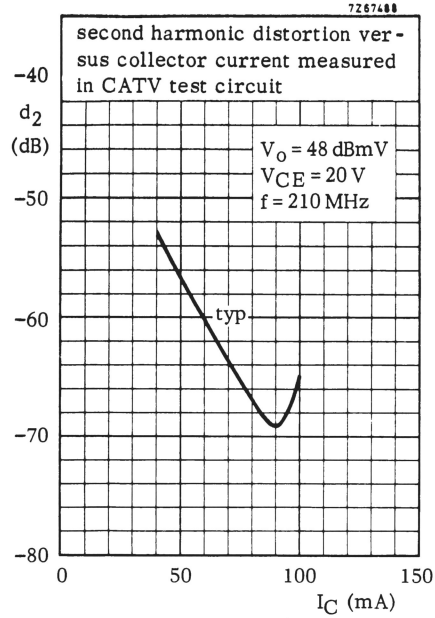
L1 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 3 mm
L2 = 5 μH ferroxcube coil (code number 3122 108 20153)
L3 = 5 turns closely wound enamelled Cu wire (0,7 mm); int. diam. 4,7 mm
L4 = 19 turns enamelled Cu wire (0,3 mm) on ferroxcube core (code no. 4322 020 91001)

APPLICATION INFORMATION (continued)









SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N resistance stabilized transistor in a TO-39 metal envelope.

Due to very linear characteristics the transistor features low cross modulation, intermodulation and second harmonic distortion. Thanks to its high transition frequency it has a high power gain combined with excellent wideband properties and low noise up to high frequencies.

The BFR95 is primarily intended for CATV and MATV applications.

QUICK REFERENCE DATA

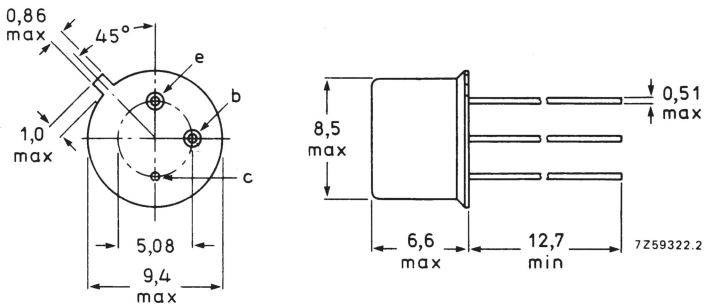
Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (d.c.)	I_C	max.	150 mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 °C
Transition frequency at f = 500 MHz I_C = 80 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
Cross modulation distortion (channel 13) I_C = 80 mA; V_{CE} = 18 V; V_o = 48 dBmV	d_{cm}	typ. <	–61 dB –57 dB
I_C = 80 mA; V_{CE} = 18 V; V_o = 32 dBmV	d_{cm}	typ. <	–93 dB –89 dB
Intermodulation distortion at $f_{(p+q-r)}$ = 194,25 MHz I_C = 80 mA; V_{CE} = 18 V; V_o = 60 dBmV	d_{im}	typ.	–64 dB
Broadband power gain I_C = 80 mA; V_{CE} = 18 V	G_p	> typ.	8 dB 9 dB
Noise figure at f = 200 MHz I_C = 80 mA; V_{CE} = 18 V	F	typ. <	9 dB 10 dB
Second harmonic distortion at $f_{(p+q)}$ = 210 MHz I_C = 80 mA; V_{CE} = 18 V; V_o = 48 dBmV	d_2	typ.	–62 dB

MECHANICAL DATA (see next page)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39
Collector connected to case



Maximum lead diameter guaranteed only for 12,7 mm.
Accessories: 56245 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) note 1	V_{CBO}	max.	30 V
Collector-emitter voltage (R_{BE} = 10 Ω) note 2	V_{CER}	max.	35 V
Collector-emitter voltage (open base) note 2	V_{CEO}	max.	25 V
Emitter-base voltage (open collector) note 3	V_{EBO}	max.	3 V
Collector current (d.c.)	I_C	max.	150 mA
Collector current (peak value); f > 1 MHz	I_{CM}	max.	300 mA
Total power dissipation			
up to T_{amb} = 25 °C	P_{tot}	max.	0,7 W
up to T_{mb} = 125 °C	P_{tot}	max.	1,5 W
Storage temperature	T_{stg}	−65 to +	200 °C
Junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE (note 4)

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	250 K/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50 K/W

Notes

1. At I_C = 100 μA.
2. At I_C = 10 mA.
3. At I_E = 100 μA.
4. K/W is SI unit for °C/W.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 20 V	I_{CBO}	<	50 μA
D.C. current gain (note 1)			
I_C = 50 mA; V_{CE} = 20 V	h_{FE}	>	30
I_C = 150 mA; V_{CE} = 20 V	h_{FE}	>	30
Transition frequency at f = 500 MHz (note 1)			
I_C = 80 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
I_C = 150 mA; V_{CE} = 20 V	f_T	typ.	3,5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 20 V	C_c	typ.	3,5 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 20 V	C_{re}	typ.	1,6 pF

APPLICATION INFORMATION

Measuring conditions: I_C = 80 mA; V_{CE} = 18 V; T_{amb} = 25 °C

Cross modulation (channel 13) (note 2)			
V_o = 48 dBmV	d_{cm}	typ. <	−61 dB −57 dB
V_o = 32 dBmV	d_{cm}	typ. <	−93 dB −89 dB
Intermodulation distortion			
$V_p = V_o$ = 60 dBmV at f_p = 196,25 MHz $V_q = V_o$ −6 dB at f_q = 203,25 MHz $V_r = V_o$ −6 dB at f_r = 205,25 MHz Measured at $f_{(p+q-r)}$ = 194,25 MHz	d_{im}	typ.	−64 dB
Broadband power gain	G_p	> typ.	8 dB 9 dB
Noise figure at f = 200 MHz	F	typ. <	9 dB 10 dB
2nd harmonic distortion at $f_{(p+q)}$ = 210 MHz f_p = 66 MHz; f_q = 144 MHz; V_o = 48 dBmV	d_2	typ. <	−62 dB −56 dB

Notes

1. Measured under pulse conditions.
2. In 12-channel measuring equipment; channel 13 unmodulated.
   V_o = output level/signal, in accordance with NCTA measuring standard.

APPLICATION INFORMATION

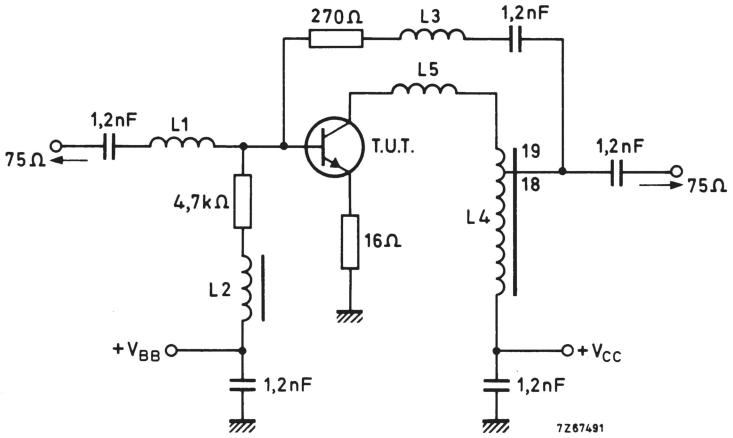


Fig. 2 CATV test circuit.
Frequency range 40 to 300 MHz
Power gain G_p typ. 9 dB

L1 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 3 mm
L2 = 5 μH Ferroxcube coil (cat. no. 3122 108 20153)
L3 = 3 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 4,7 mm
L4 = 19 turns enamelled Cu wire (0,3 mm) on Ferroxcube core (cat. no. 4322 020 91001)
L5 = 2 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 3 mm.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
It is primarily intended for use in u.h.f. and microwave amplifiers such as in aerial amplifiers, radar systems, oscilloscopes, spectrum analysers, etc.
The transistor features very low intermodulation distortion and high power gain; thanks to its very high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	75	mA
Total power dissipation up to T_{amb} = 60 °C	P_{tot}	max.	500	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 50 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	<	1,4	pF
Noise figure at optimum source impedance I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,3	dB
Max. unilateral power gain I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,2	dB
Intermodulation distortion at T_{amb} = 25 °C I_C = 50 mA; V_{CE} = 10 V; R_L = 75 Ω; V_o = 500 mV $f_{(p+q-r)}$ = 493,25 MHz	d_{im}	typ.	−60	dB

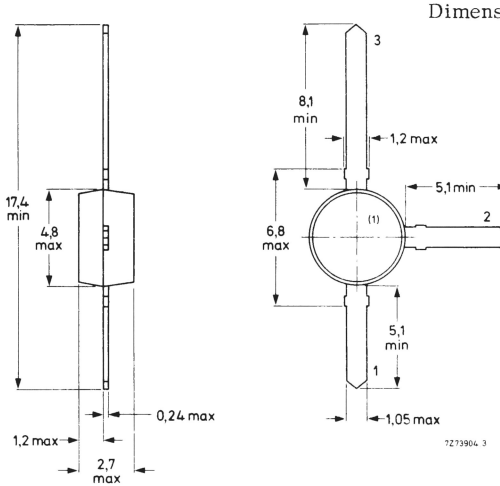
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

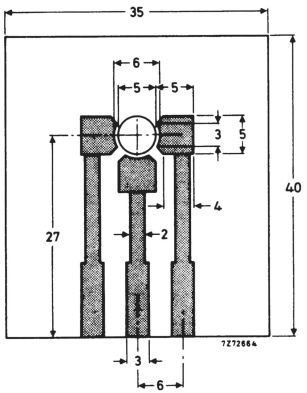
Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,0	V
Currents				
Collector current (d.c.)	I_C	max.	75	mA
Collector current (peak value); f > 1 MHz	I_{CM}	max.	150	mA
Power dissipation				
Total power dissipation up to T_{amb} = 60 °C mounted on a fibre-glass print of 40 mm x 35 mm x 1,5 mm	P_{tot}	max.	500	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +175		°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print of 40 mm x 35 mm x 1,5 mm	$R_{th\ j\text{-}a}$	=	0,23	°C/mW

Requirements for fibre-glass print

Dimensions in mm



Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm.
Tracks are fully tin-lead plated.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V	I_{CBO}	<	100	nA

D.C. current gain [1])

I_C = 50 mA; V_{CE} = 10 V	h_{FE}	>	25	
		typ.	50	
I_C = 75 mA; V_{CE} = 10 V	h_{FE}	>	25	
		typ.	52	

Transition frequency at f = 500 MHz [1])

I_C = 50 mA; V_{CE} = 10 V	f_T	>	4,0	GHz
		typ.	5,0	GHz
I_C = 75 mA; V_{CE} = 10 V	f_T	>	4,4	GHz
		typ.	5,5	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,3	pF

Emitter capacitance at f = 1 MHz

$I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	6,5	pF

Feedback capacitance at f = 1 MHz

I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1,0	pF
		<	1,4	pF

Noise figure at optimum source impedance

I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,3	dB
I_C = 50 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	3,8	dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

I_C = 50 mA; V_{CE} = 10 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	15,2	dB

[1]) Measured under pulse conditions.

CHARACTERISTICS (continued)

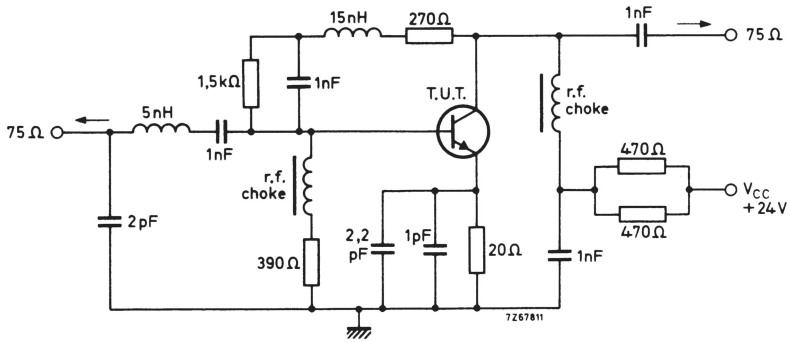
Intermodulation distortion at T_{amb} = 25 °C

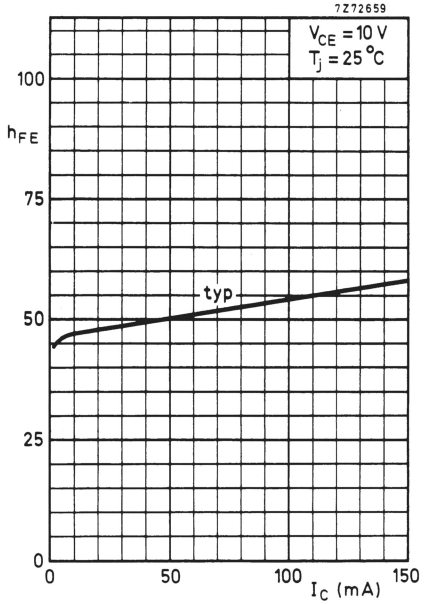
I_C = 50 mA; V_{CE} = 10 V; R_L = 75 Ω

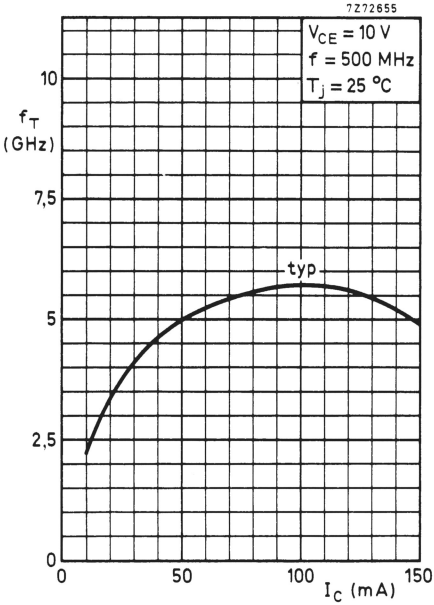
$V_p = V_o$ = 500 mV at f_p = 495,25 MHz
$V_q = V_o$ − 6 dB at f_q = 503,25 MHz
$V_r = V_o$ − 6 dB at f_r = 505,25 MHz

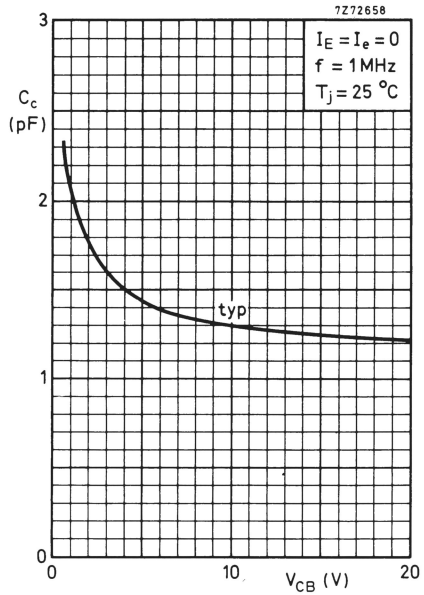
Measured at $f_{(p + q - r)}$ = 493,25 MHz d_{im} typ. −60 dB

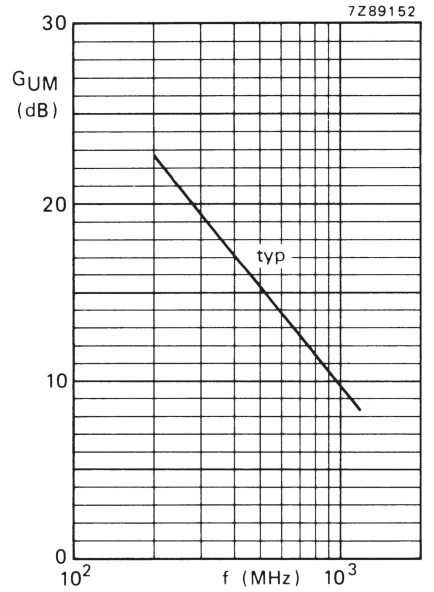
Intermodulation test circuit:









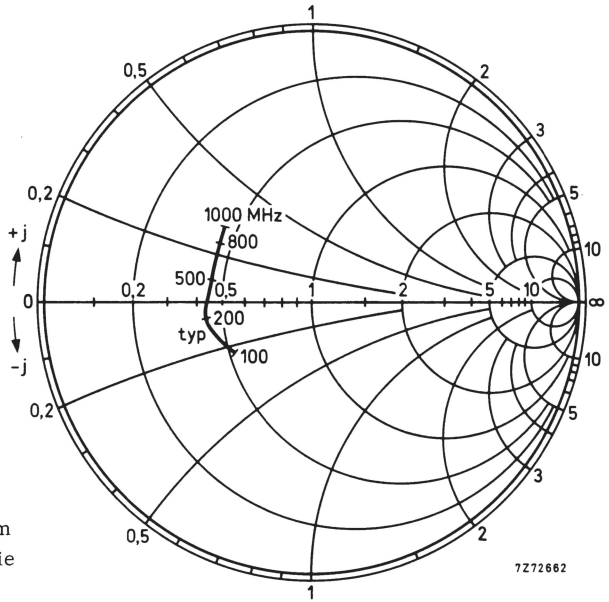


V_{CE} = 10 V; I_C = 50 mA; T_{amb} = 25 °C.

V_{CE} = 10 V

I_C = 50 mA

T_{amb} = 25 °C

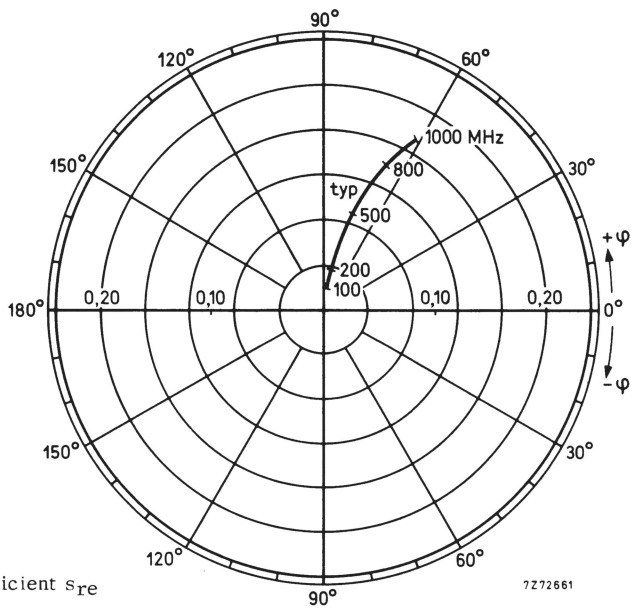


Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50

V_{CE} = 10 V

I_C = 50 mA

T_{amb} = 25 °C

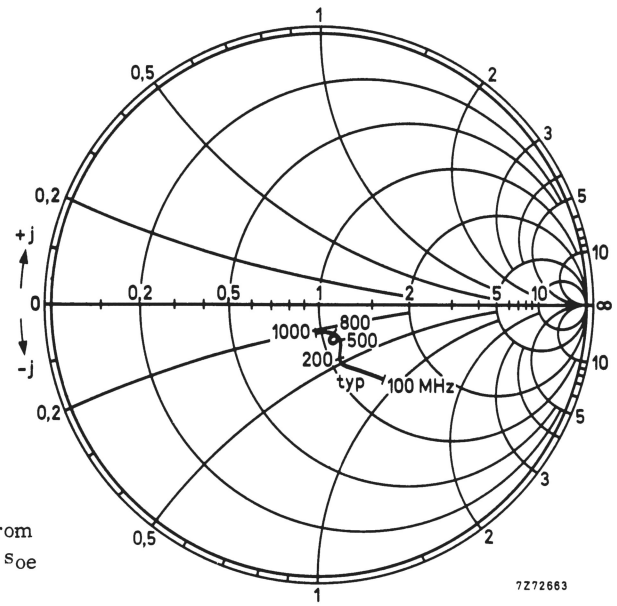


Reverse transmission coefficient s_{re}

V_{CE} = 10 V

I_C = 50 mA

T_{amb} = 25 °C

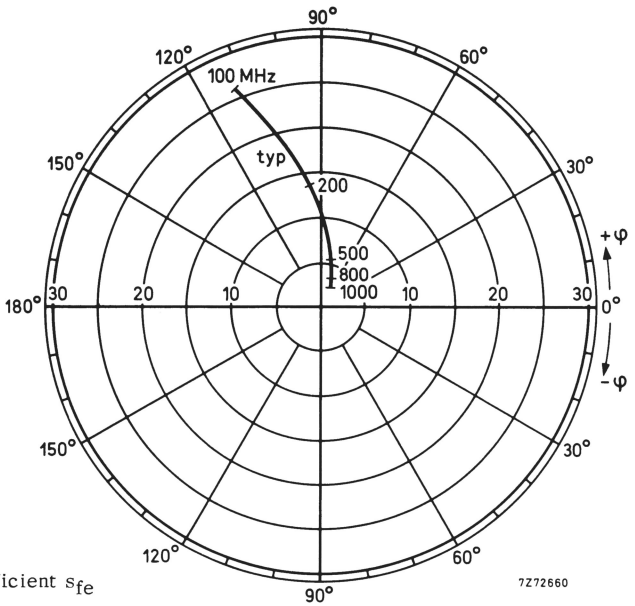


Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50

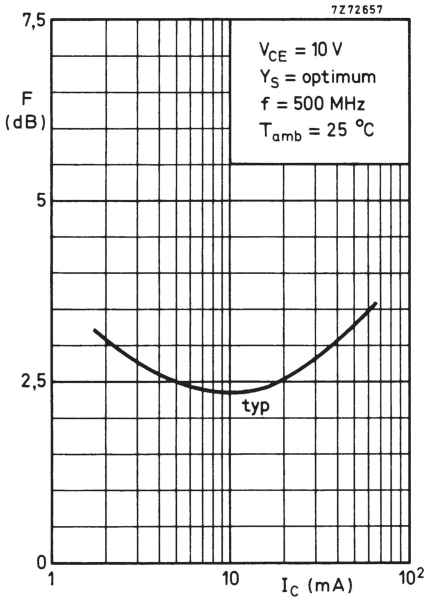
V_{CE} = 10 V

I_C = 50 mA

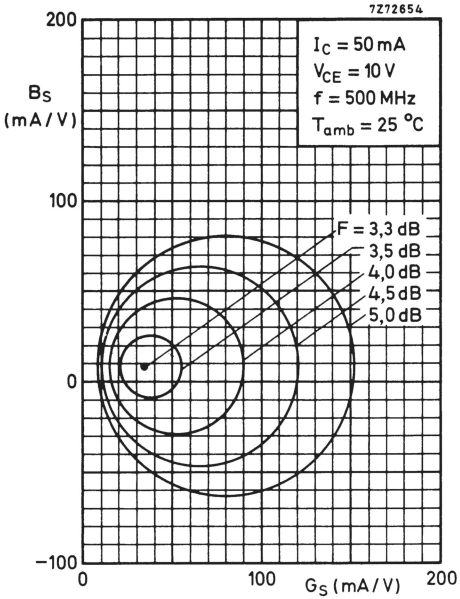
T_{amb} = 25 °C



Forward transmission coefficient s_{fe}



circles of constant noise figure



SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a plastic T-package, primarily intended for MATV applications. The device features excellent output voltage capabilities.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (d.c.)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	700	mW
Junction temperature	T_j	max.	175	°C
Transition frequency at f = 500 MHz I_C = 70 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V	C_{re}	typ.	1	pF
Noise figure at optimum source impedance I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	4,0	dB
Maximum unilateral power gain I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5	dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	700	mV
Output power at 1 dB gain compression	P_{L1}	typ.	+ 21	dBm
Third order intercept point	ITO	typ.	+ 40	dBm

MECHANICAL DATA

SOT-37 (see Fig. 1).

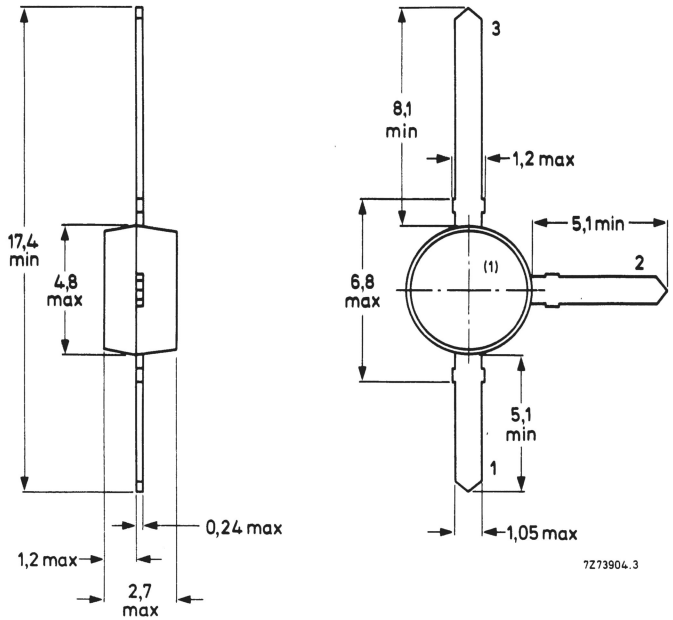
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,0	V
Collector current (d.c.)	I_C	max.	100	mA
Total power dissipation up to T_{amb} = 70 °C mounted on a fibre-glass print (see Fig. 2) of 50 mm x 50 mm x 1,5 mm	P_{tot}	max.	700	mW
Storage temperature	T_{stg}	−65 to +	175	°C
Junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 50 mm x 50 mm x 1,5 mm	$R_{th\ j\text{-}a}$	=	150	K/W

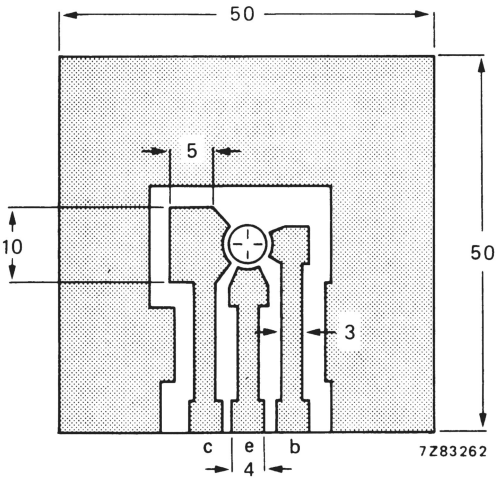


Fig. 2 Requirements for fibre-glass print. (Dimensions in mm.) Single-sided 35 μm Cu-clad epoxy fibre-glass print, thickness 1,5 mm. Tracks are fully tin-lead plated. Shaded area is Cu.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current I_E = 0; V_{CB} = 10 V	I_{CBO}	<	100	nA
D.C. current gain* I_C = 70 mA; V_{CE} = 10 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz I_C = 70 mA; V_{CE} = 10 V	f_T	typ.	5	GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	1,5	pF
Emitter capacitance at f = 1 MHz $I_C = I_c$ = 0; V_{EB} = 0,5 V	C_e	typ.	6,5	pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 10 V; T_{amb} = 25 °C	C_{re}	typ.	1	pF
Noise figure at optimum source impedance I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	F	typ.	4,0	dB
Maximum unilateral power gain (s_{re} assumed to be zero) G_{UM} (in dB) = $10 \log \frac{\lvert s_{fe}\rvert^2}{(1-\lvert s_{ie}\rvert^2)\,(1-\lvert s_{oe}\rvert^2)}$ I_C = 70 mA; V_{CE} = 10 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11,5	dB

* Measured under pulse conditions.

s-parameters (common emitter) at V_{CE} = 5 V

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
5	40	0,75/ −41,5°	0,026/+ 69,1°	15,1/+ 155,2°	0,93/ −17,4°
	200	0,62/−128,1°	0,064/+ 41,9°	7,1/+ 106,9°	0,53/ −43,3°
	500	0,55/−174,6°	0,087/+ 47,0°	3,2/ + 79,8°	0,40/ −53,2°
	800	0,56/+ 158,7°	0,115/+ 56,5°	2,1/ + 65,0°	0,39/ −63,2°
	1000	0,58/+ 146,7°	0,135/+ 59,2°	1,7/ + 56,6°	0,39/ −72,5°
	1200	0,61/+ 135,5°	0,159/+ 61,7°	1,4/ + 48,9°	0,39/ −83,0°
10	40	0,60/ −59,1°	0,022/+ 64,1°	24,3/+ 147,2°	0,86/ −26,6°
	200	0,54/−146,1°	0,050/+ 49,4°	9,1/+ 100,7°	0,38/ −54,7°
	500	0,50/+ 175,8°	0,087/+ 59,3°	3,9/ + 78,6°	0,27/ −62,8°
	800	0,52/+ 152,4°	0,129/+ 63,7°	2,5/ + 65,8°	0,27/ −72,2°
	1000	0,53/+ 141,0°	0,157/+ 63,9°	2,1/ + 58,0°	0,27/ −80,7°
	1200	0,56/+ 130,7°	0,186/+ 63,3°	1,7/ + 51,2°	0,27/ −90,9°
30	40	0,39/−105,6°	0,015/+ 60,7°	39,6/+ 133,3°	0,69/ −44,1°
	200	0,44/−168,4°	0,041/+ 65,9°	11,1/ + 94,3°	0,23/ −78,2°
	500	0,46/+ 165,1°	0,094/+ 70,3°	4,7/ + 77,3°	0,16/ −88,4°
	800	0,48/+ 145,4°	0,146/+ 69,2°	3,0/ + 66,5°	0,16/ −98,3°
	1000	0,51/+ 135,6°	0,175/+ 66,6°	2,5/ + 60,1°	0,16/−109,3°
	1200	0,53/+ 126,2°	0,206/+ 64,2°	2,1/ + 54,0°	0,17/−119,7°
50	40	0,37/−129,3°	0,013/+ 63,4°	44,6/+ 127,8°	0,62/ −51,4°
	200	0,43/−174,7°	0,040/+ 71,5°	11,5/ + 92,5°	0,19/ −89,2°
	500	0,45/+ 162,4°	0,095/+ 72,7°	4,8/ + 76,8°	0,14/−101,5°
	800	0,48/+ 143,4°	0,151/+ 70,1°	3,1/ + 66,5°	0,14/−111,5°
	1000	0,50/+ 134,3°	0,182/+ 67,4°	2,5/ + 60,4°	0,14/−121,5°
	1200	0,52/+ 124,9°	0,215/+ 64,8°	2,1/ + 54,6°	0,15/−130,7°
70	40	0,38/−141,7°	0,011/+ 65,1°	46,9/+ 124,9°	0,57/ −55,8°
	200	0,43/−177,6°	0,040/+ 73,7°	11,6/ + 91,6°	0,18/ −96,3°
	500	0,46/+ 161,2°	0,095/+ 73,9°	4,9/ + 76,5°	0,13/−109,5°
	800	0,49/+ 143,1°	0,150/+ 70,6°	3,1/ + 66,4°	0,13/−120,7°
	1000	0,49/+ 133,5°	0,186/+ 67,7°	2,5/ + 60,2°	0,14/−126,2°
	1200	0,52/+ 124,1°	0,218/+ 65,0°	2,1/ + 54,6°	0,15/−135,3°

s-parameters (common emitter) at V_{CE} = 10 V

I_C mA	f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
5	40	0,77/ −38,9°	0,023/+ 69,1°	15,2/+ 156,2°	0,93/ −15,4°
	200	0,62/−124,0°	0,059/+ 43,1°	7,4/+ 108,3°	0,57/ −38,0°
	500	0,54/−172,5°	0,081/+ 48,0°	3,4/ + 80,8°	0,45/ −46,8°
	800	0,55/+ 159,9°	0,106/+ 57,8°	2,2/ + 65,9°	0,43/ −57,1°
	1000	0,56/+ 147,2°	0,126/+ 61,5°	1,8/ + 57,5°	0,43/ −64,9°
	1200	0,58/+ 135,9°	0,150/+ 64,4°	1,5/ + 50,1°	0,42/ −74,7°
10	40	0,62/ −54,5°	0,020/+ 64,9°	24,5/+ 148,7°	0,87/ −23,5°
	200	0,53/−142,3°	0,046/+ 49,6°	9,6/+ 102,0°	0,42/ −47,8°
	500	0,48/+ 177,6°	0,080/+ 59,4°	4,2/ + 79,4°	0,31/ −54,2°
	800	0,50/+ 153,2°	0,118/+ 64,0°	2,7/ + 66,4°	0,31/ −63,5°
	1000	0,52/+ 142,3°	0,143/+ 64,1°	2,2/ + 59,1°	0,31/ −70,0°
	1200	0,54/+ 131,8°	0,168/+ 64,3°	1,8/ + 52,4°	0,30/ −79,5°
30	40	0,41/ −94,4°	0,014/+ 62,2°	40,9/+ 135,0°	0,72/ −39,2°
	200	0,42/−164,6°	0,039/+ 65,5°	11,8/ + 95,1°	0,25/ −64,5°
	500	0,42/+ 167,0°	0,087/+ 70,4°	4,9/ + 77,9°	0,19/ −71,1°
	800	0,45/+ 146,6°	0,136/+ 69,3°	3,2/ + 67,1°	0,18/ −79,1°
	1000	0,47/+ 136,6°	0,166/+ 67,2°	2,6/ + 60,6°	0,18/ −83,8°
	1200	0,49/+ 126,3°	0,196/+ 65,0°	2,2/ + 54,6°	0,17/ −95,1°
50	40	0,36/−114,4°	0,012/+ 62,7°	46,5/+ 129,6°	0,63/ −45,7°
	200	0,40/−171,0°	0,038/+ 70,4°	12,3/ + 93,1°	0,20/ −71,4°
	500	0,41/+ 163,9°	0,090/+ 72,4°	5,1/ + 77,1°	0,16/ −79,7°
	800	0,44/+ 144,7°	0,140/+ 70,1°	3,3/ + 66,7°	0,15/ −86,0°
	1000	0,47/+ 135,3°	0,168/+ 67,3°	2,7/ + 60,8°	0,14/ −95,3°
	1200	0,49/+ 125,2°	0,197/+ 65,0°	2,3/ + 55,2°	0,14/−106,6°
70	40	0,35/−125,4°	0,012/+ 63,6°	49,1/+ 125,7°	0,58/ −49,5°
	200	0,40/−173,7°	0,038/+ 72,7°	12,4/ + 92,0°	0,18/ −74,8°
	500	0,41/+ 162,6°	0,091/+ 73,2°	5,2/ + 76,7°	0,15/ −82,0°
	800	0,44/+ 144,1°	0,143/+ 70,2°	3,3/ + 66,4°	0,14/ −87,4°
	1000	0,46/+ 134,6°	0,175/+ 67,3°	2,7/ + 60,2°	0,13/ −95,3°
	1200	0,48/+ 124,1°	0,200/+ 64,8°	2,3/ + 54,6°	0,13/−109,5°

Output voltage at d_{im} = –60 dB (see Figs 3 and 5)
(DIN45004B, par. 6.3: 3-tone)
I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C

$V_p = V_o$ at d_{im} = –60 dB; f_p = 795,25 MHz
$V_q = V_o$ –6 dB; f_q = 803,25 MHz
$V_r = V_o$ –6 dB; f_r = 805,25 MHz

Measured at $f_{(p+q-r)}$ = 793,25 MHz — V_o typ. 700 mV

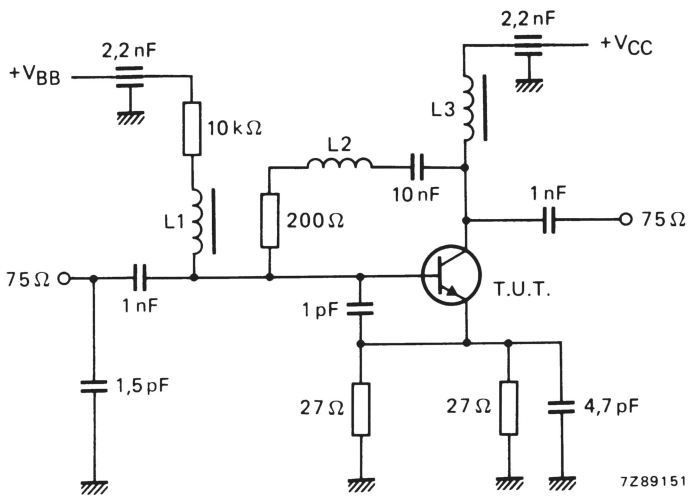
Second harmonic distortion (see Figs 3 and 6)
I_C = 70 mA; V_{CE} = 10 V; R_L = 75 Ω; T_{amb} = 25 °C

$V_p = V_o$ = 316 mV = 50 dBmV; f_p = 250 MHz
$V_q = V_o$ = 316 mV = 50 dBmV; f_q = 560 MHz

measured at $f_{(p+q)}$ = 810 MHz — d_2 typ. –52 dB

→ Output power at 1 dB gain compression (see Fig. 3)
I_C = 70 mA; V_{CE} = 10 V
R_L = 75 Ω; T_{amb} = 25 °C
measured at f = 800 MHz — P_{L1} typ. + 21 dBm

→ Third order intercept point (see Fig. 3)
I_C = 70 mA; V_{CE} = 10 V
R_L = 75 Ω; T_{amb} = 25 °C
P_p = ITO – 6 dB; f_p = 800 MHz
P_q = ITO – 6 dB; f_q = 801 MHz
and at $f_{(2p-q)}$ = 799 MHz — ITO typ. + 40 dBm



→ Fig. 3 Intermodulation distortion and second harmonic distortion test circuit.

L1 = L3 = 5 μH micro choke
L2 = 1½ turns Cu wire (0,4 mm); internal diameter 3,0 mm; winding pitch 1 mm

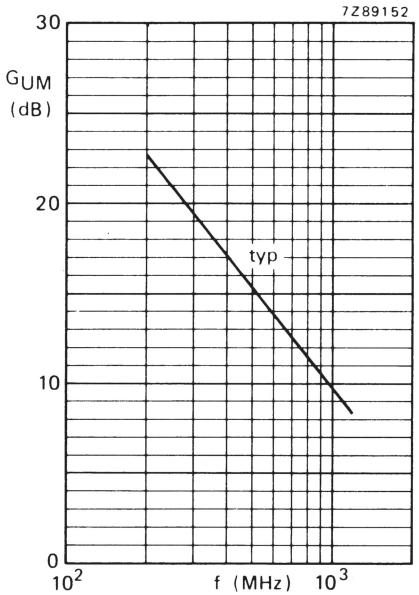


Fig. 4 V_{CE} = 10 V; I_C = 70 mA; T_{amb} = 25 °C.

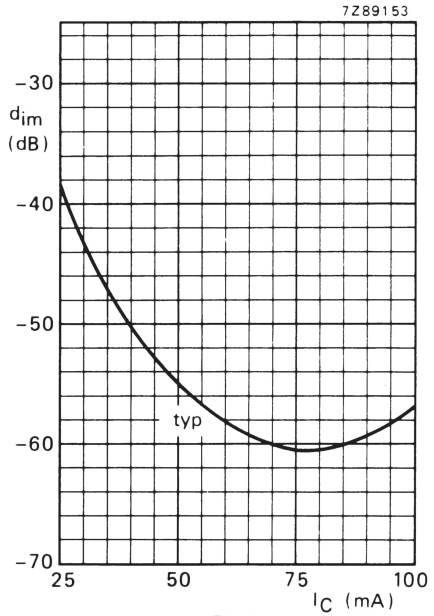


Fig. 5.

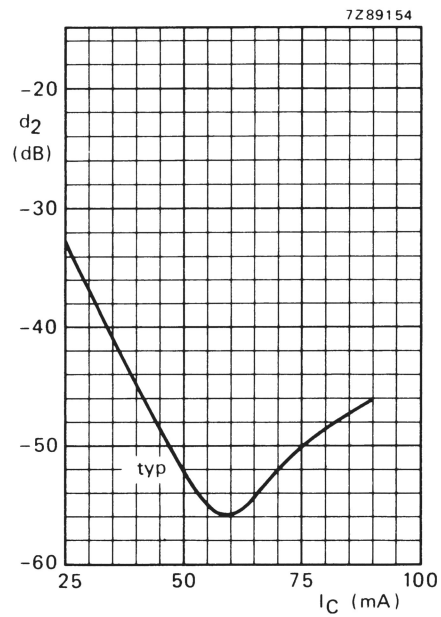


Fig. 6.

Intermodulation distortion (Fig. 5) and second harmonic distortion (Fig. 6) are measured in circuit (see Fig. 3).

Fig. 5 V_{CE} = 10 V; V_o = 700 mV = 56,9 dBmV; $f_{(p+q-r)}$ = 793,25 MHz; T_{amb} = 25 °C.

Fig. 6 V_{CE} = 10 V; V_o = 316 mV = 50 dBmV; $f_{(p+q)}$ = 810 MHz; T_{amb} = 25 °C.

Conditions for Figs 7 and 8:

V_{CE} = 10 V; I_C = 70 mA;
T_{amb} = 25 °C.

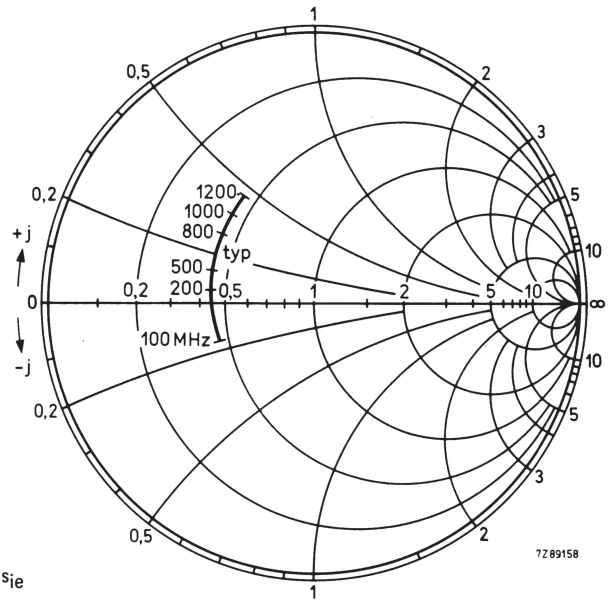


Fig. 7 Input impedance derived from input reflection coefficient s_{ie} co-ordinates in ohm x 50.

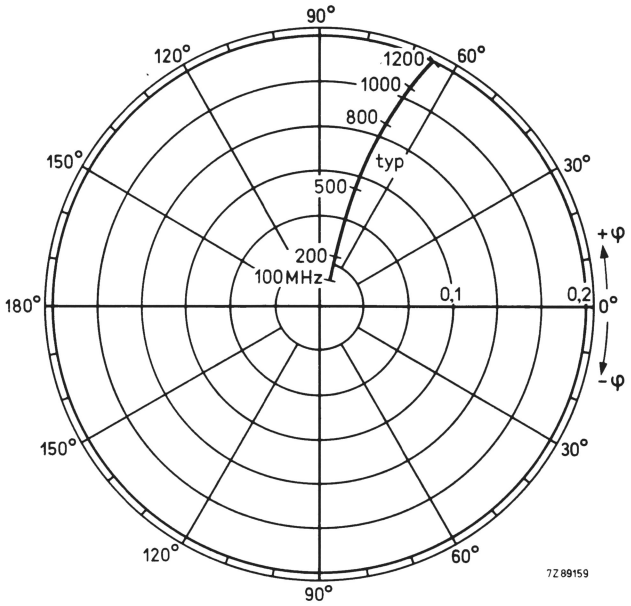


Fig. 8 Reverse transmission coefficient s_{re}.

Conditions for Figs 9 and 10:

V_{CE} = 10 V; I_C = 70 mA;
T_{amb} = 25 °C.

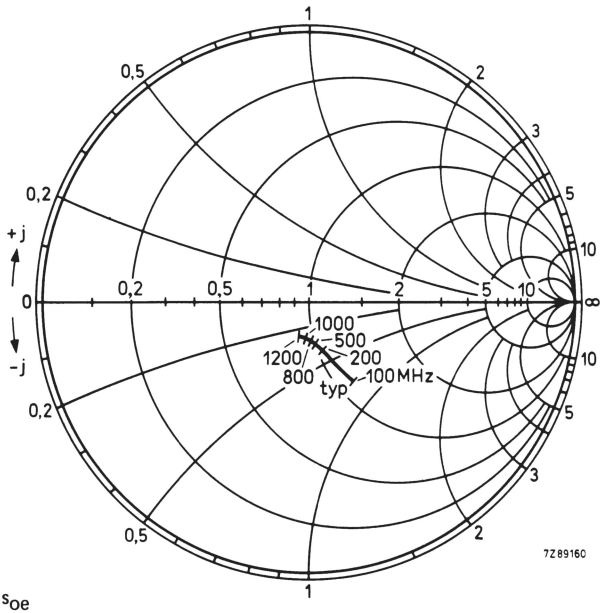


Fig. 9 Output impedance derived from output reflection coefficient s_{oe} co-ordinates in ohm x 50.

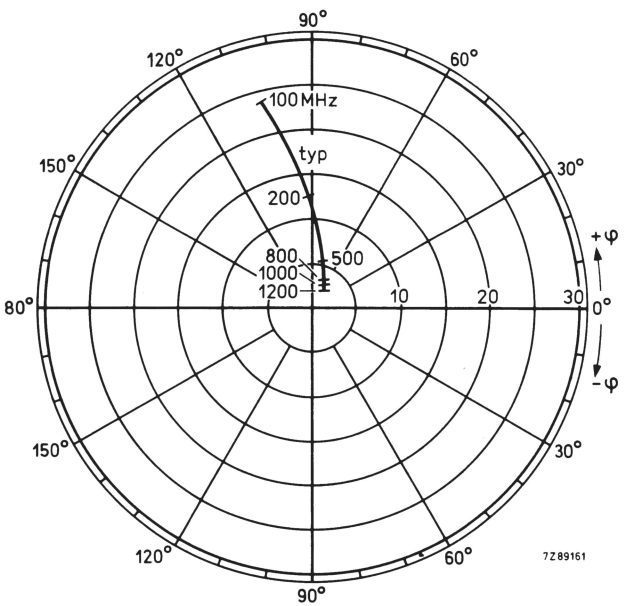


Fig. 10 Forward transmission coefficient s_{fe}.

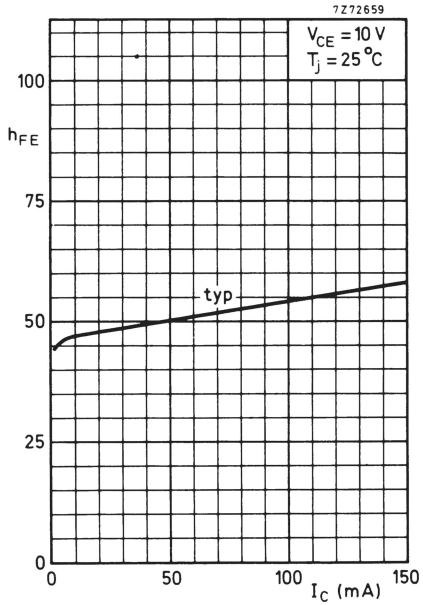


Fig. 11.

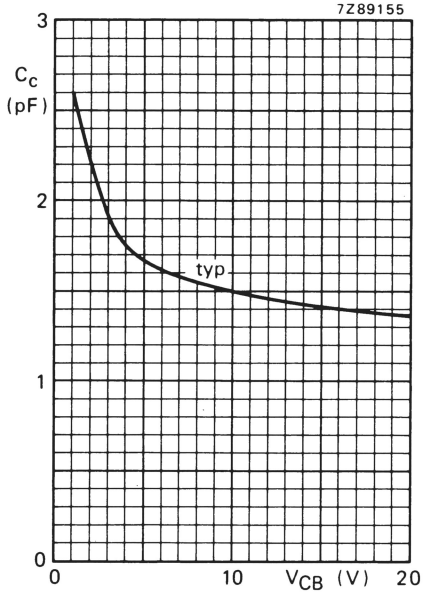


Fig. 12 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

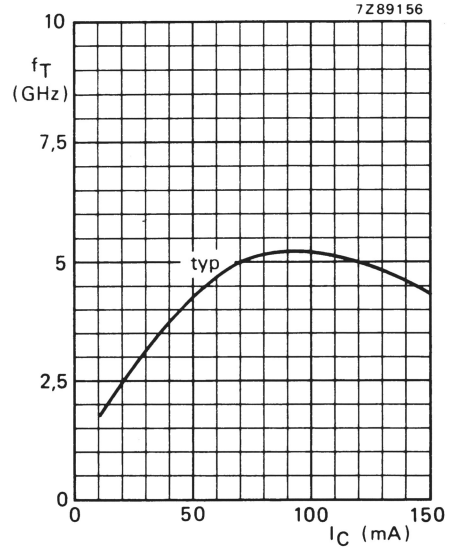


Fig. 13 V_{CE} = 10 V; f = 500 MHz; T_j = 25 °C.

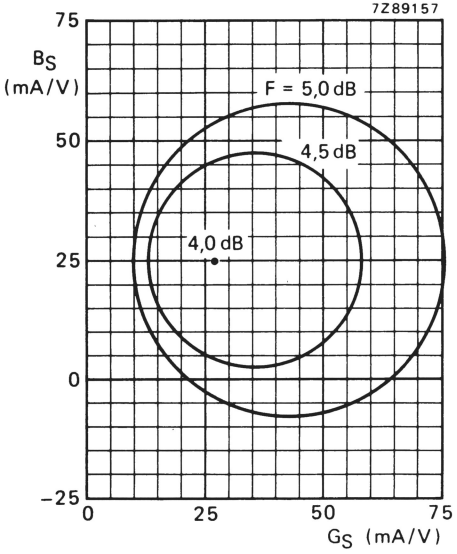


Fig. 14 Circles of constant noise figure.
V_{CE} = 10 V; I_C = 70 mA; f = 800 MHz;
T_{amb} = 25 °C; typical values.

CLASS-B OPERATION

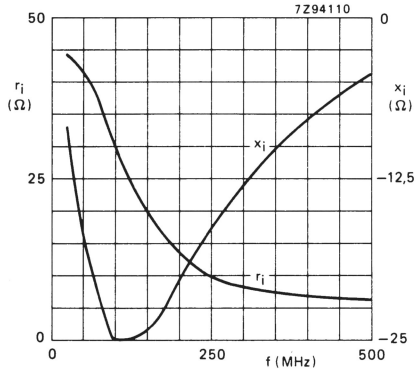


Fig. 15 Input impedance (series components).

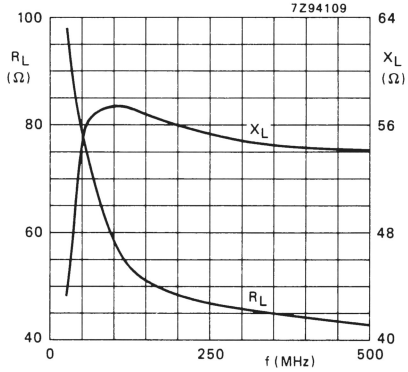


Fig. 16 Load impedance (series components).

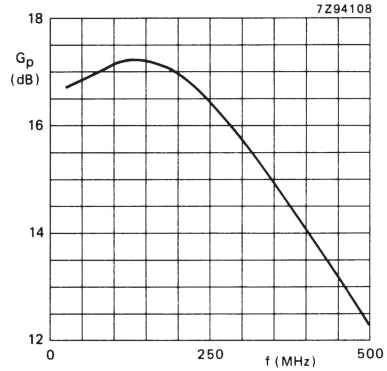


Fig. 17 Power gain versus frequency.

Conditions for Figs 15 to 17:

V_{CE} = 10 V; P_L = 500 mW; T_{amb} = 25 °C;

OPERATING NOTE for Figs 15 to 17:

A base-emitter resistor of 47 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
It is primarily intended for use in u.h.f. low power amplifiers such as in pocket phones, paging systems, etc.
The transistor features low current consumption (100 μA - 1 mA); thanks to its high transition frequency, it also has excellent wideband properties and low noise up to high frequencies.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	8	V
Collector-emitter voltage (open base)	V_{CEO}	max.	5	V
Collector current (d.c.)	I_C	max.	2,5	mA
Total power dissipation up to T_{amb} = 135 °C	P_{tot}	max.	30	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz I_C = 1 mA; V_{CE} = 1 V	f_T	typ.	2,3	GHz
Feedback capacitance at f = 1 MHz I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C	C_{re}	<	0,4	pF
Noise figure at optimum source impedance I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,8	dB
Max. unilateral power gain I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17	dB

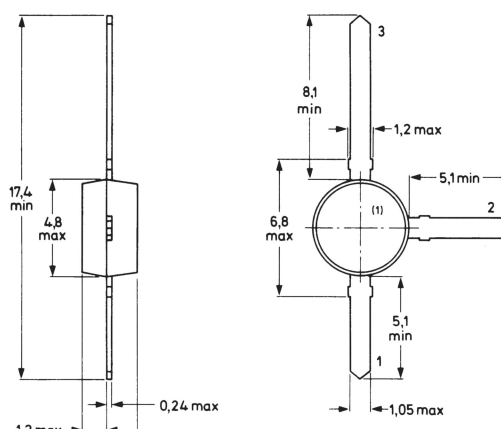
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	8	V
Collector-emitter voltage (open base)	V_{CEO}	max.	5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Current				
Collector current (d.c.)	I_C	max.	2,5	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	5,0	mA
Power dissipation				
Total power dissipation up to T_{amb} = 135 °C	P_{tot}	max.	30	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

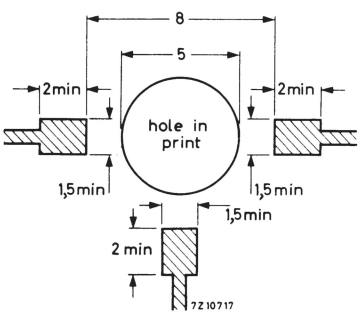
THERMAL RESISTANCE

From junction to ambient in free air

mounted on a glass-fibre print *)
of 40 mm x 25 mm x 1 mm $R_{th\ j\text{-}a}$ = 0,5 °C/mW

*) Requirements for glass-fibre print

(dimensions in mm)



CHARACTERISTICS T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 5 V	I_{CBO}	<	50	nA

D.C. current gain 1)

I_C = 10 µA ; V_{CE} = 1 V	h_{FE}	>	20	
		typ.	30	
I_C = 1 mA; V_{CE} = 1 V	h_{FE}	>	20	
		typ.	40	

Saturation voltages

I_C = 10 µA ; I_B = 1 µA	V_{CEsat}	<	200	mV
	V_{BEsat}	<	750	mV
I_C = 1 mA; I_B = 0,1 mA	V_{CEsat}	<	175	mV
	V_{BEsat}	<	900	mV

Transition frequency at f = 500 MHz 1)

I_C = 1 mA; V_{CE} = 1 V	f_T	>	1,2	GHz
		typ.	2,3	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 0,5 V	C_c	<	0,55	pF

Emitter capacitance at f = 1 MHz

$I_C = I_c$ = 0; V_{EB} = 0	C_e	<	0.45	pF

Feedback capacitance at f = 1 MHz

I_C = 1 mA; V_{CE} = 1 V; T_{amb} = 25 °C	C_{re}	<	0,4	pF

Noise figure at optimum source impedance

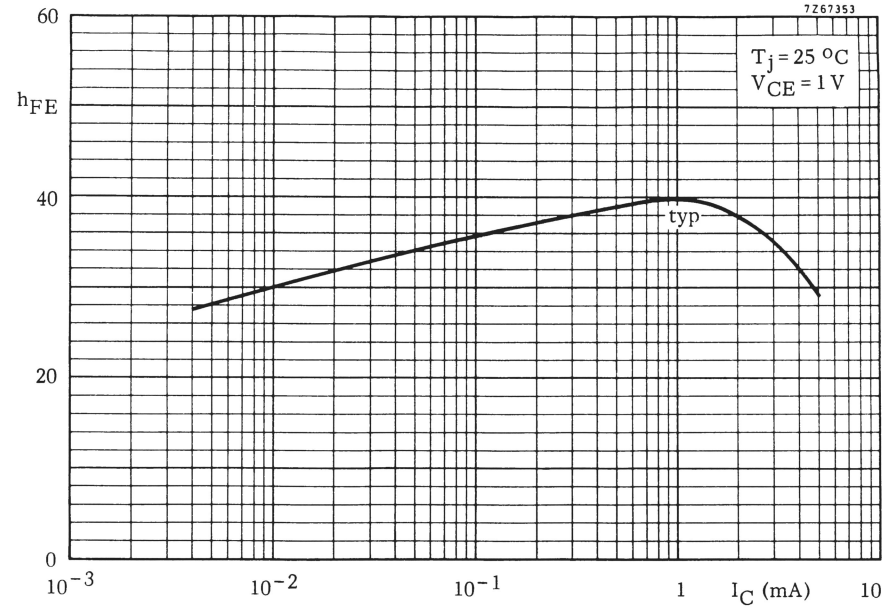
I_C = 0,1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	5,5	dB
I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	F	typ.	3,8	dB

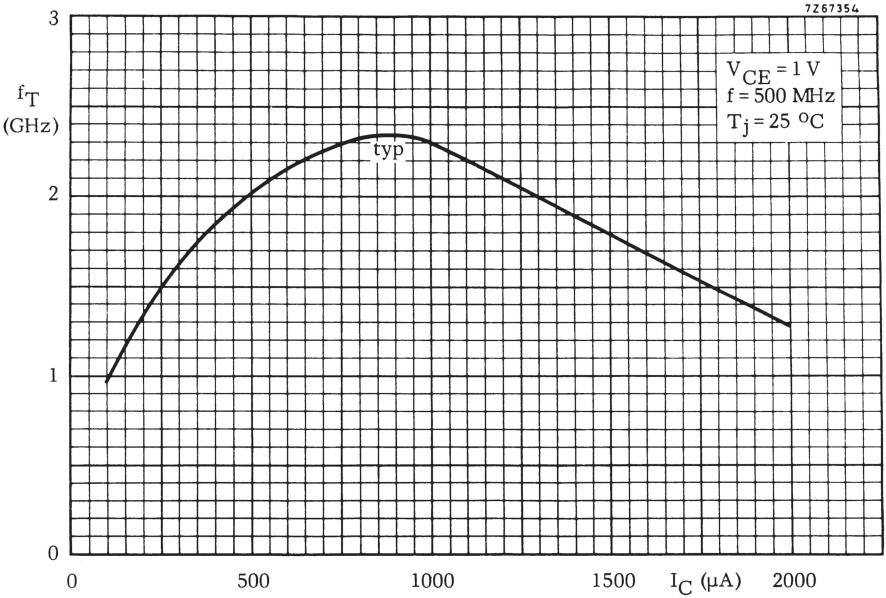
Max. unilateral power gain (s_{re} assumed to be zero)

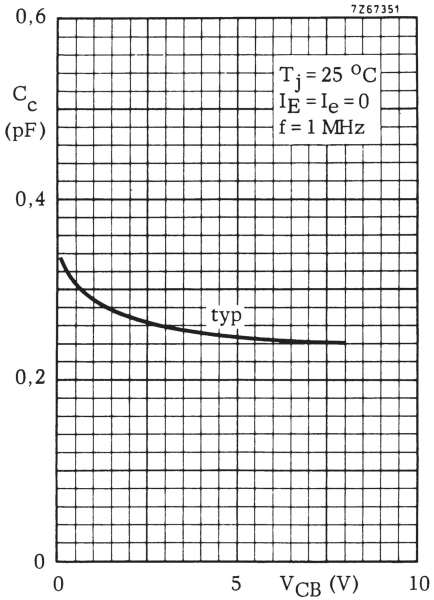
$$G_{UM}\ (\text{in dB}) = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

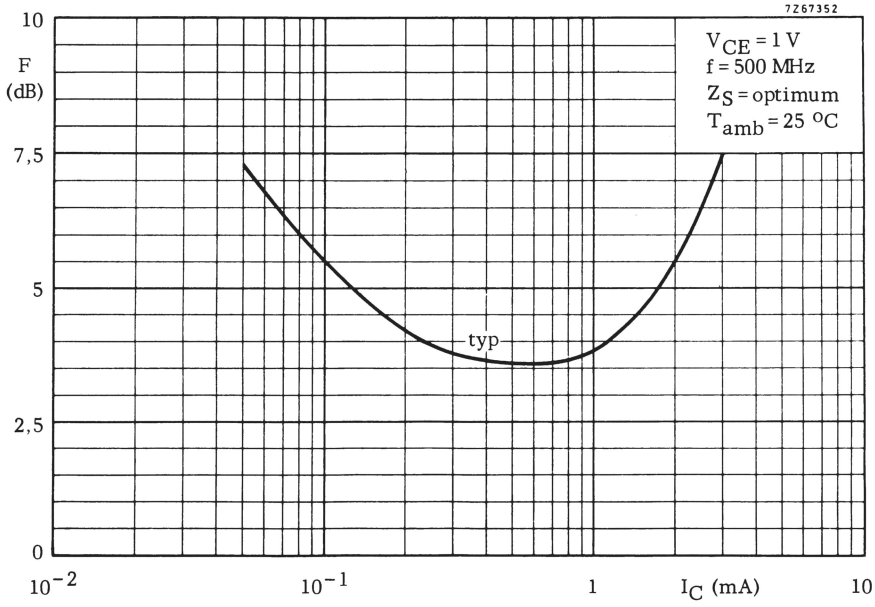
I_C = 1 mA; V_{CE} = 1 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	24	dB
I_C = 1 mA; V_{CE} = 1 V; f = 500 MHz; T_{amb} = 25 °C	G_{UM}	typ.	17	dB
I_C = 1 mA; V_{CE} = 1 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	11	dB

1) Measured under pulse conditions.


7Z67353
60
h_{FE}
40
20
0
10^{-3}
10^{-2}
10^{-1}
1
10
I_C (mA)
T_j = 25 °C
V_{CE} = 1 V
typ


7Z67354
3
f_T
(GHz)
2
1
0
0
500
1000
1500
2000
I_C (μA)
V_{CE} = 1 V
f = 500 MHz
T_j = 25 °C
typ

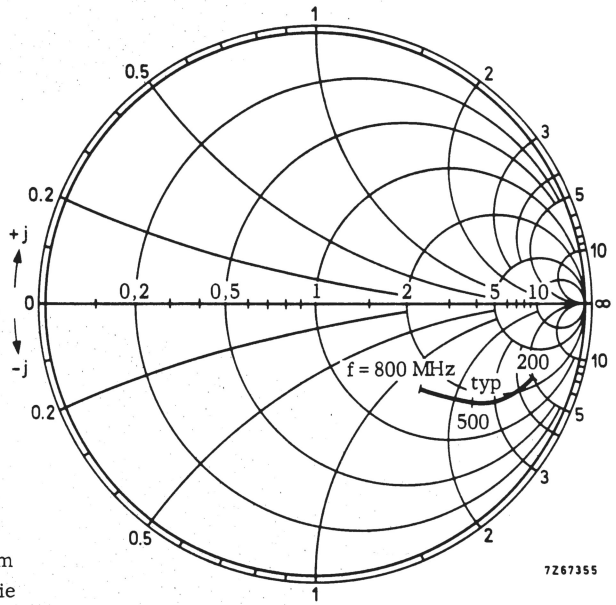

7Z67351
0,6
C_c (pF)
0,4
0,2
0
T_j = 25 °C
$I_E = I_e = 0$
f = 1 MHz
typ
0
5
V_{CB} (V)
10


7Z67352
10
F (dB)
7,5
5
2,5
0
V_{CE} = 1 V
f = 500 MHz
Z_S = optimum
T_{amb} = 25 °C
typ
10^{-2}
10^{-1}
1
I_C (mA)
10

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C

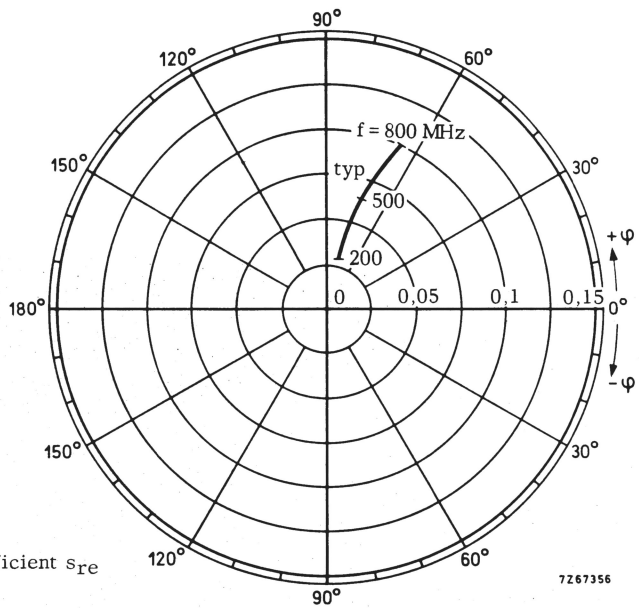


Input impedance derived from input reflection coefficient s_{ie} coordinates in ohm x 50

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C

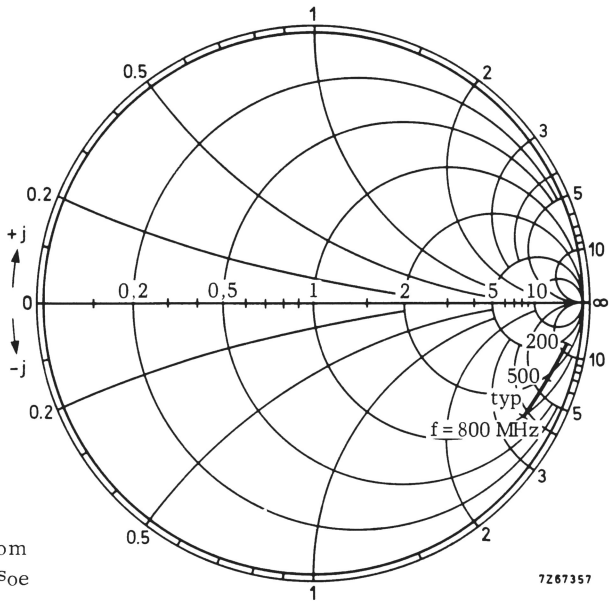


Reverse transmission coefficient s_{re}

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C

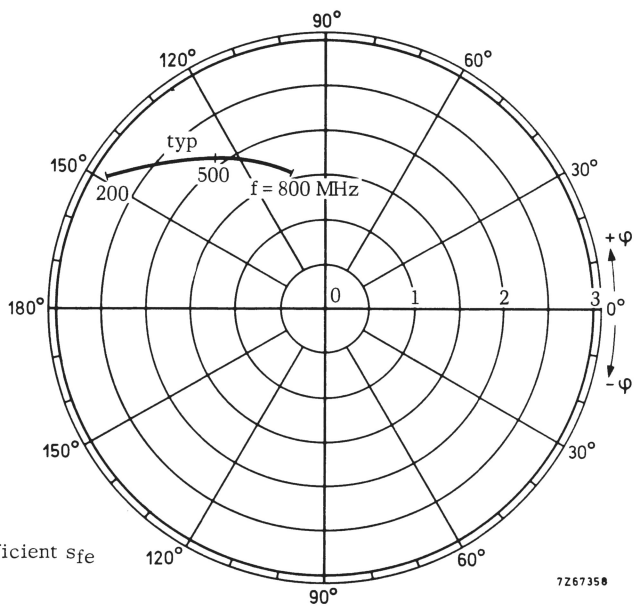


Output impedance derived from output reflection coefficient s_{oe} coordinates in ohm x 50

V_{CE} = 1 V

I_C = 1 mA

T_{amb} = 25 °C



Forward transmission coefficient s_{fe}

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a TO-39 metal envelope, with the collector connected to the case. The transistor has extremely good intermodulation properties and a high power gain. It is a ruggedized version of the BFW16, which it succeeds. It is primarily intended for:

- Final and driver stages of channel and band aerial amplifiers with high output power for bands I, II, III and IV/V (40–860 MHz).
- Final stage of the wideband vertical amplifier in high speed oscilloscopes.

QUICK REFERENCE DATA

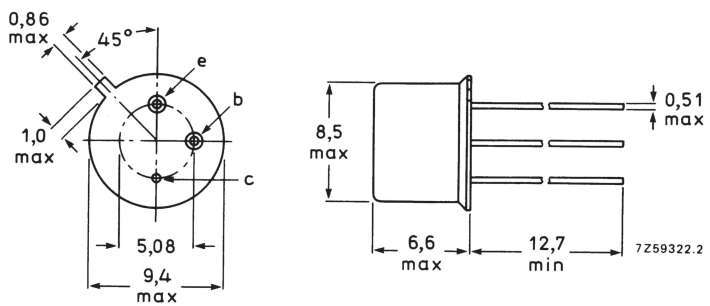
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	300	mA
Total power dissipation up to $T_{mb} = 125$ °C	P_{tot}	max.	1,5	W
Junction temperature	T_j	max.	200	°C
Feedback capacitance at f = 1 MHz $I_C = 10$ mA; $V_{CE} = 15$ V	C_{re}	typ.	1,7	pF
Transition frequency $I_C = 150$ mA; $V_{CE} = 15$ V; f = 500 MHz	f_T	typ.	1,2	GHz
Power gain (not neutralized)			f = 200 | 800	MHz
$I_C = 70$ mA; $V_{CE} = 18$ V	G_p	typ.	16 | 6,5	dB
Output power $d_{im} = -30$ dB; VSWR at output < 2; $I_C = 70$ mA; $V_{CE} = 18$ V	P_o	typ.	150 | 90	mW

MECHANICAL DATA

Dimensions in mm

Collector connected to case

Fig. 1 TO-39.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} \leq 50\ \Omega$) peak value	V_{CERM}	max.	40	V [1]
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V [1]
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V
Currents				
Collector current (d.c.)	I_C	max.	150	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	300	mA
Power dissipation				
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1.5	W
Temperatures				
Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	250	°C/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	°C/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	1.2	°C/W

[1] I_C = 10 mA.

CHARACTERISTICS

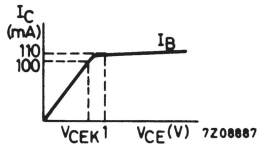
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 20 V; T_j = 150 °C	I_{CBO}	<	20	μA

Knee voltage

I_C = 100 mA; I_B = value for which I_C = 110 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	>	25	

Transition frequency

I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1.2	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 15 V	C_c	<	4	pF

Feedback capacitance at f = 1 MHz

I_C = 10 mA; V_{CE} = 15 V; T_{amb} = 25 °C	$-C_{re}$	typ.	1.7	pF

Noise figure at f = 200 MHz

I_C = 30 mA; V_{CE} = 15 V; R_S = 75 Ω; T_{amb} = 25 °C	F	<	6	dB

Power gain (not neutralized)

		f = 200	800	MHz
I_C = 70 mA; V_{CE} = 18 V; T_{amb} = 25 °C	G_p	typ. 16	6.5	dB

CHARACTERISTICS (continued)

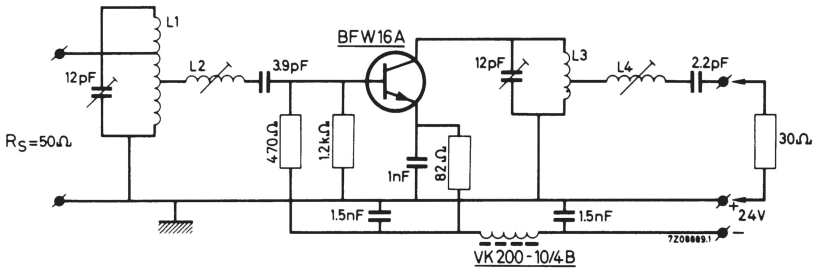
Intermodulation characteristics

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 70 mA; V_{CE} = 18 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9)

P_o	>	130	mW
	typ.	150	mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 220\ \Omega$; $C_L = -5.6$ pF.

C_{oe} is found by 4 pF of the transistor and 1.6 pF by the mounting system concerning of a borium nitride washer between the envelope of the transistor and the chassis.

Adjustment procedure

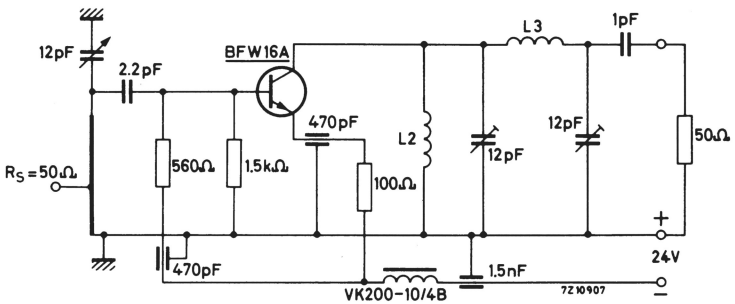
1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 5.6 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

CHARACTERISTICS (continued)

Intermodulation characteristics

2. Output power at f = 800 MHz; T_{amb} = 25 °C
I_C = 70 mA; V_{CE} = 18 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o > 70 mW typ. 90 mW

Test circuit:



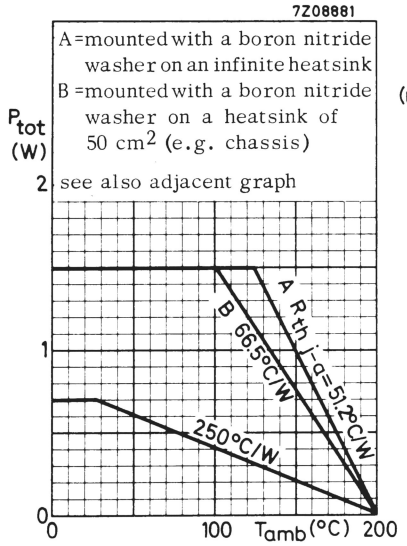
Coil data:
L1 = 25 mm x 7 mm x 0.85 mm silver plated Cu strip
Tap of the input at 5 mm from earth.
L2 = 13 turns enamelled Cu wire (0.6 mm); int. diam. 8 mm
L3 = 1.5 turns Cu wire (1.3 mm); int. diam. 8 mm

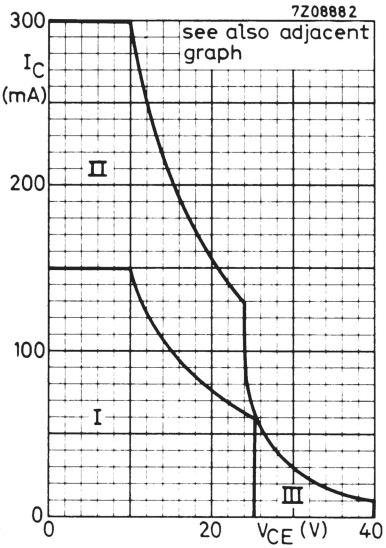
Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C(V_{CE} - V_{CEK})}{2} = 480 \text{ mW}.$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 480 mW.
With this adjusting method care must be taken, that the transistor is not destructed by second breakdown (the voltage swing may not exceed the rated V_{CER} value). Therefore as soon as clipping occurs, the increase of the input signal should be stopped until the clipping has been eliminated. After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve. The V.S.W.R. of the output is then ≤ 2 over the whole channel.

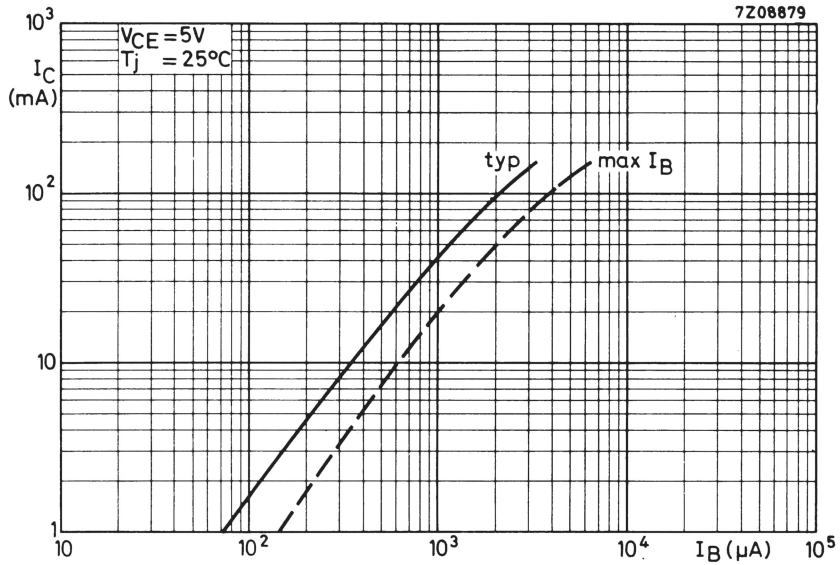


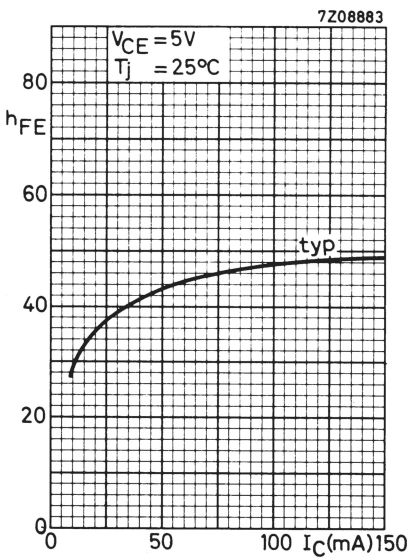


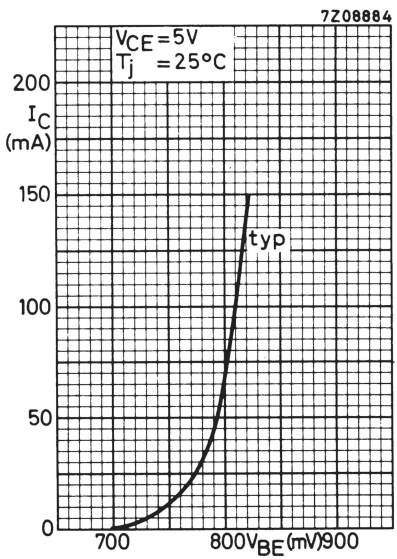
I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

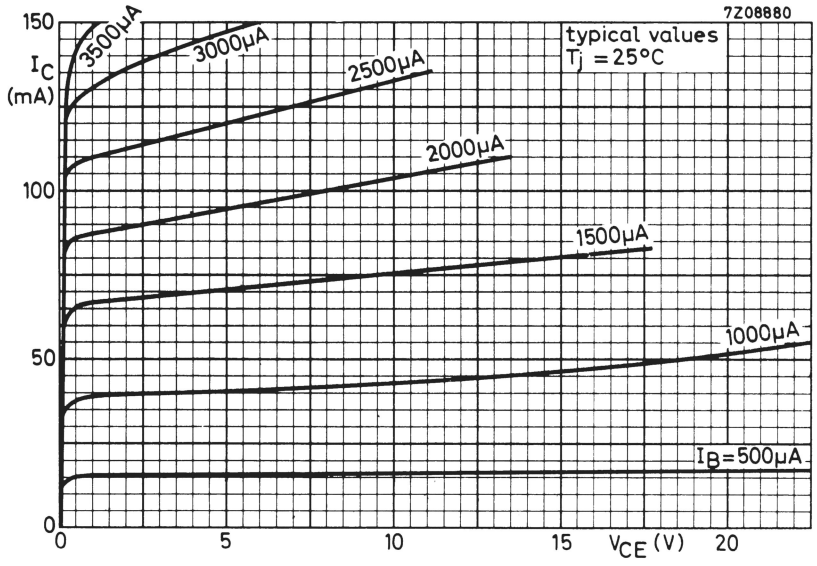
II = Additional region of operation at $f \geq 1$ MHz.

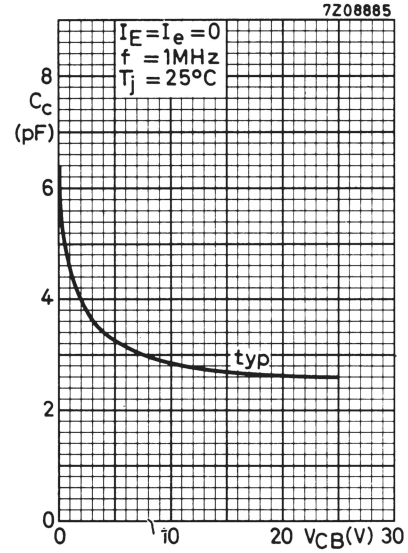
III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leq 50\ \Omega$ and $f \geq 1$ MHz.

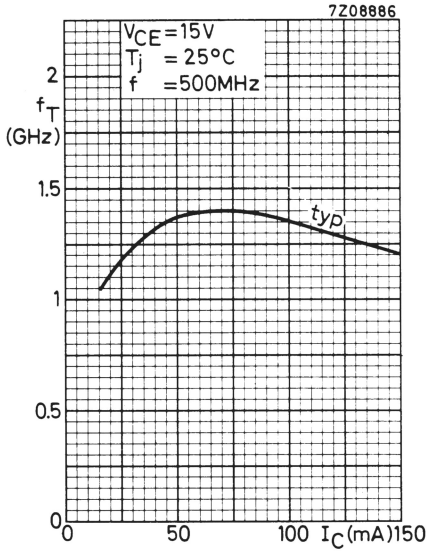

7Z08879
V_{CE} = 5V
T_j = 25°C
I_C (mA)
10^3
10^2
10
1
typ
max I_B
10
10^2
10^3
10^4
I_B (μA)
10^5


7Z08883
V_{CE} = 5V
T_j = 25°C
h_{FE}
80
60
40
20
0
typ
0
50
100 I_C(mA)150


7Z08884
V_{CE} = 5V
T_j = 25°C
I_C (mA)
200
150
100
50
0
typ
700
800V_{BE}(mV)900


7Z08880
typical values
T_j = 25°C
I_C (mA)
3500μA
3000μA
2500μA
2000μA
1500μA
1000μA
I_B=500μA
150
100
50
0
0
5
10
15
V_{CE} (V)
20


7Z08885
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
C_c (pF)
8
6
4
2
0
typ
0
10
20
V_{CB}(V)
30


7Z08886
V_{CE}=15V
T_j = 25°C
f = 500MHz
f_T (GHz)
2
1.5
1
0.5
0
typ
0
50
100
I_C(mA)
150

APPLICATION INFORMATION

Performance of channel- and band amplifiers [1])

Frequency range	channel 4 61-68	channel 9 202-209	channel 55 742-750	band I 47-68	band II 87.5-108	band III 174-230	MHz
Transistor used in							
final stage	BFW16A	BFW16A	BFW16A	BFW16A	BFW16A	BFW16A	
driver stage		BFW16A	BFW16A			BFW16A	
second stage			BFY90				
first stage	BFY90	BFY90	BFY90	BFY90	BFY90	BFY90	
Output power at							
d_{im} = -30 dB	150 [2])	150 [2])	100				mW
d_{im} = -50 dB					30		mW
d_{im} = -60 dB				10		10	mW
Power gain	50	44	26.5	51	43	39	dB
Noise figure	7	6	8	6.0-6.5	6.5	6.5	dB
V.S.W.R. over the whole channel or band							
for the input	< 2	< 2	< 2	< 2	< 2	< 2	
for the output	< 2	< 2	< 2	< 2	< 2	< 2	
Load impedance	30	30	50	30	30	30	Ω
Source impedance	60	60	50	60	60	60	Ω

[1]) Application information bulletins of all these amplifiers and a study of intermodulation are available on request.

[2]) V_o = 2.2 V over R_L = 30 Ω or
V_o = 3 V over R_L = 60 Ω.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a TO-39 metal envelope, with the collector connected to the case. The transistor has extremely good intermodulation properties and a high power gain. It is a ruggedized version of the BFW17, which it succeeds. It is primarily intended for final and driver stages of channel and band aerial amplifiers with high output power for bands I, II and III (40–230 MHz).

QUICK REFERENCE DATA

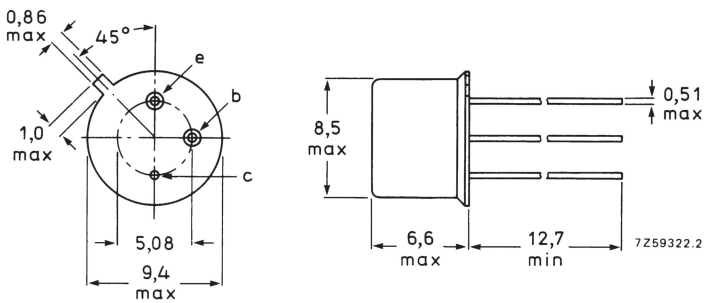
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40 V
Collector-emitter voltage (open base)	V_{CEO}	max.	25 V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	300 mA
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1,5 W
Junction temperature	T_j	max.	200 °C
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 15 V	C_{re}	typ.	1,7 pF
Transition frequency I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1,1 GHz
Power gain (not neutralized) I_C = 70 mA; V_{CE} = 18 V; f = 200 MHz	G_p	typ.	16 dB
Output power d_{im} = −30 dB; VSWR at output < 2; I_C = 70 mA; V_{CE} = 18 V	P_o	typ.	150 mW

MECHANICAL DATA

Dimensions in mm

Collector connected to case

Fig. 1 TO-39.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages					
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V	
Collector-emitter voltage ($R_{BE} \leq 50\ \Omega$) peak value	V_{CERM}	max.	40	V	1)
Collector-emitter voltage (open base)	V_{CEO}	max.	25	V	1)
Emitter-base voltage (open collector)	V_{EBO}	max.	2	V	
Currents					
Collector current (d.c.)	I_C	max.	150	mA	
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	300	mA	
Power dissipation					
Total power dissipation up to T_{mb} = 125 °C	P_{tot}	max.	1.5	W	
Temperatures					
Storage temperature	T_{stg}	−65 to +200		°C	
Junction temperature	T_j	max.	200	°C	

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	250	°C/W
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	50	°C/W
From mounting base to heatsink mounted with top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	1.2	°C/W

1) I_C = 10 mA.

CHARACTERISTICS

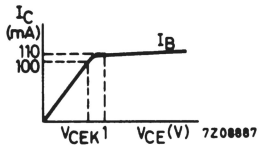
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 20 V; T_j = 150 °C	I_{CBO}	<	20	μA

Knee voltage

I_C = 100 mA; I_B = value for which I_C = 110 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 150 mA; V_{CE} = 5 V	h_{FE}	>	25	

Transition frequency

I_C = 150 mA; V_{CE} = 15 V; f = 500 MHz	f_T	typ.	1.1	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 15 V	C_c	<	4	pF

Feedback capacitance at f = 1 MHz

I_C = 10 mA; V_{CE} = 15 V; T_{amb} = 25 °C	$-C_{re}$	typ.	1.7	pF

Power gain (not neutralized)

I_C = 70 mA; V_{CE} = 18 V f = 200 MHz; T_{amb} = 25 °C	G_p	typ.	16	dB

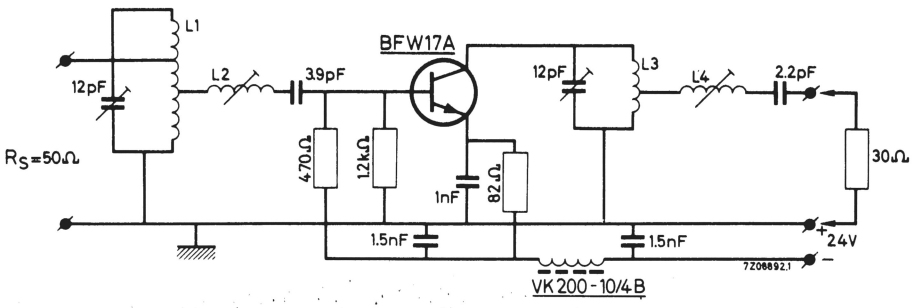
CHARACTERISTICS (continued)

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{amb} = 25 °C

   I_C = 70 mA; V_{CE} = 18 V; V.S.W.R. at output < 2
   f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
   measured at $f_{(2q-p)}$ = 208 MHz (Channel 9) P_o typ. 150 mW

   Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C}$$

   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

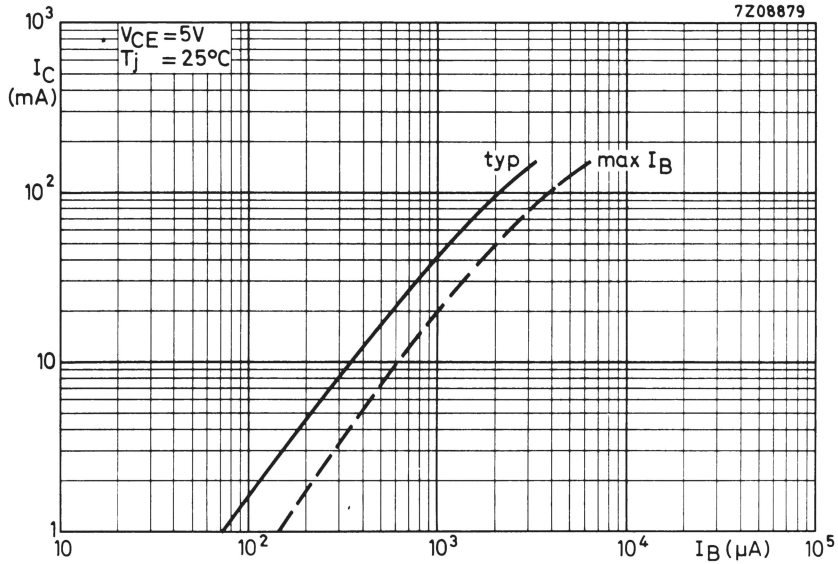
For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
R_L = 220 Ω; C_L = −5.6 pF.
C_{oe} is found by 4 pF of the transistor and 1.6 pF by the mounting system concerning of a borium nitride washer between the envelope of the transistor and the chassis.

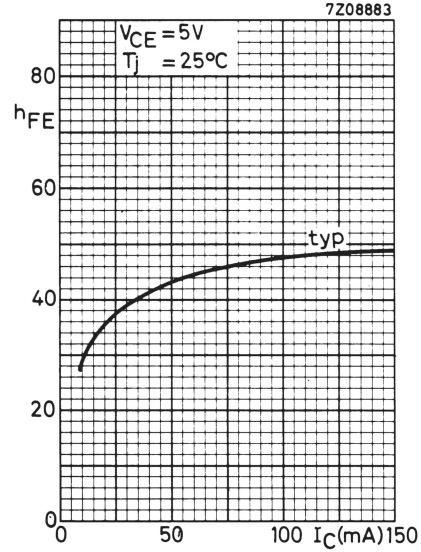
Adjustment procedure

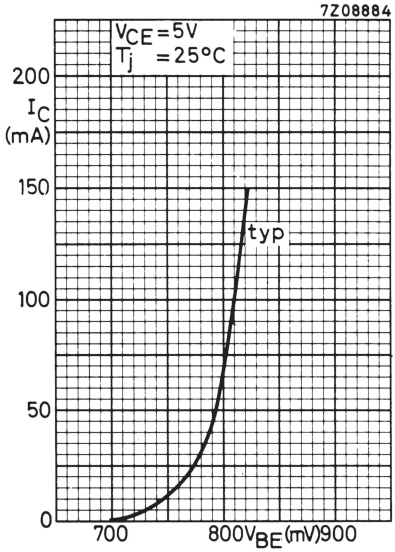
1. Remove the transistor and connect a dummy consisting of a 220 Ω resistor in parallel with a 5.6 pF capacitor between the collector and emitter connections of the output circuit.

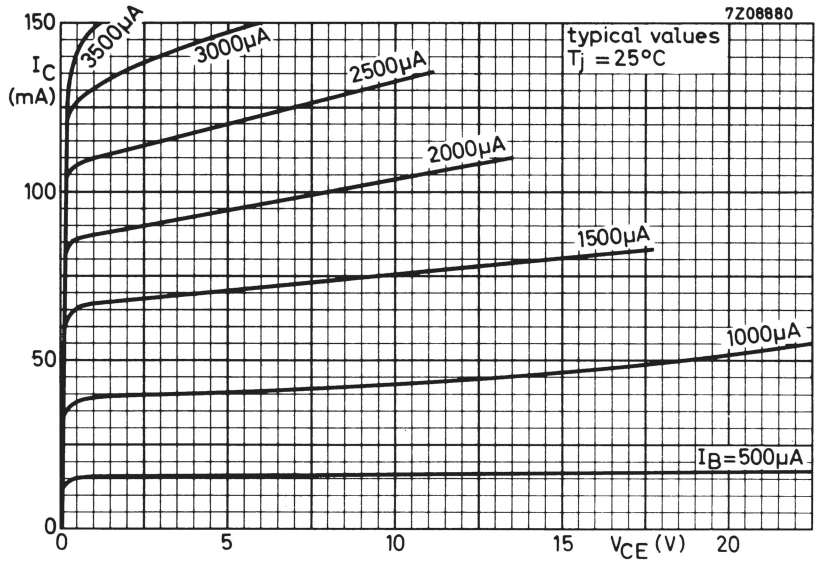
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.

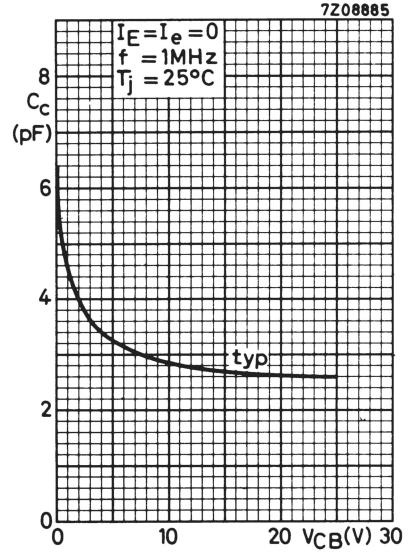
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

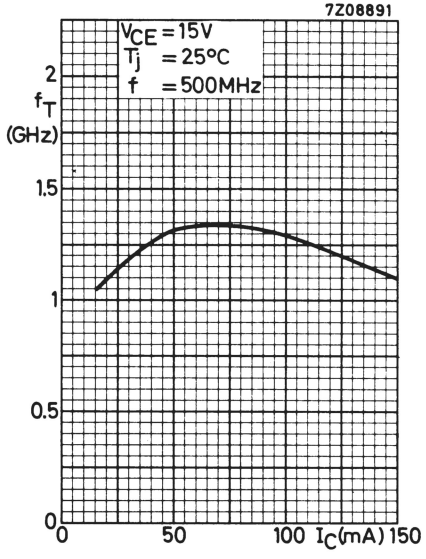

7Z08879
10^3
I_C (mA)
V_{CE} = 5V
T_j = 25°C
typ
max I_B
10^2
10
1
10
10^2
10^3
10^4
I_B (μA)
10^5

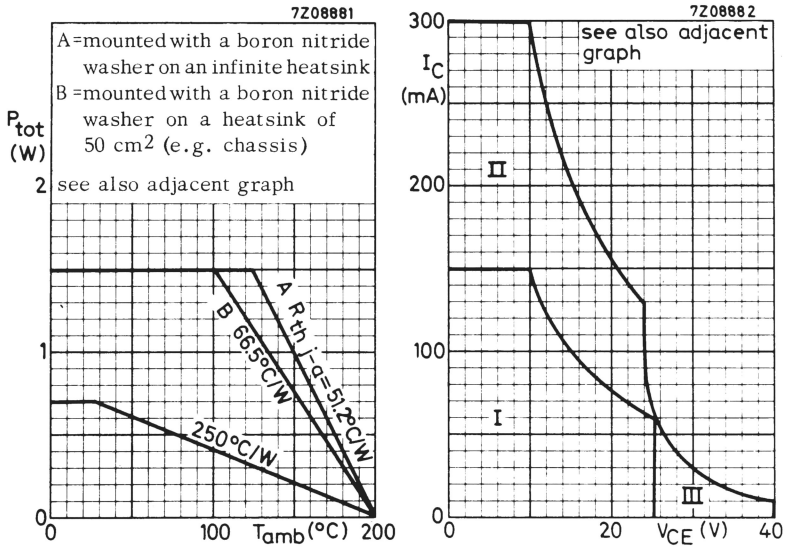

7Z08883
V_{CE} = 5V
T_j = 25°C
80
h_{FE}
60
typ
40
20
0
0
50
100 I_C(mA)150


7Z08884
V_{CE} = 5V
T_j = 25°C
200
I_C (mA)
150
typ
100
50
0
700
800V_{BE}(mV)900


7Z08880
typical values
T_j = 25°C
3500μA
3000μA
2500μA
2000μA
1500μA
1000μA
I_B=500μA
I_C (mA)
150
100
50
0
0
5
10
15
20
V_{CE} (V)


7Z08885
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
typ
C_c (pF)
8
6
4
2
0
0
10
20
V_{CB}(V) 30


7Z08891
V_{CE} = 15V
T_j = 25°C
f = 500MHz
f_T (GHz)
2
1.5
1
0.5
0
0
50
100
I_C(mA) 150



I = Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

II = Additional region of operation at $f \geq 1$ MHz

III = Operating under pulsed conditions is allowed, provided the transistor is cut-off with $R_{BE} \leq 50\ \Omega$ and $f \geq 1$ MHz.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N multi-emitter transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case. The transistor has very low intermodulation distortion and very high power gain. It is primarily intended for:

- Wideband vertical amplifiers in high speed oscilloscopes.
- Wideband aerial amplifiers (40–860 MHz).
- Television distribution amplifiers.

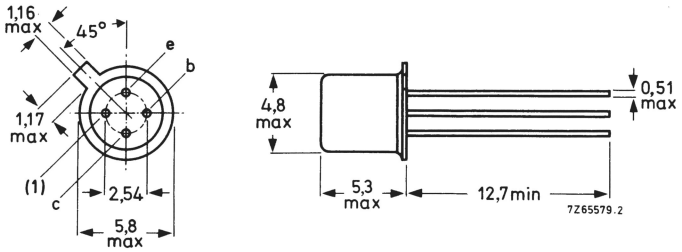
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	250	mW
Junction temperature	T_j	max.	200	°C
Feedback capacitance at f = 1 MHz I_C = 2 mA; V_{CE} = 5 V	C_{re}	typ.	0,8	pF
Transition frequency I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1,6	GHz
			f = 200 | 800	MHz
Power gain (not neutralized) I_C = 30 mA; V_{CE} = 5 V	G_p	typ.	21 | 7,5	dB
Intermodulation distortion I_C = 30 mA; V_{CE} = 6 V; R_L = 37,5 Ω; V_o = 100 mV at f_p = 183 MHz; V_o = 100 mV at f_q = 200 MHz; measured at $f_{(2q-p)}$ = 217 MHz	d_{im}	typ.	−60	dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages					
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	20	V	
Collector-emitter voltage (open base)					
I_C = 10 mA	V_{CEO}	max.	10	V	2)
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V	
Currents					
Collector current (d.c.)	I_C	max.	50	mA	
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA	
Power dissipation					
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	250	mW	
Temperatures					
Storage temperature	T_{stg}	−65 to +200		°C	
Junction temperature	T_j	max.	200	°C	

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0.7	°C/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0.5	°C/mW

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA

D.C. current gain

I_C = 25 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	

Transition frequency [1]

I_C = 50 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.6	GHz

Collector capacitance at f = 1 MHz [2]

$I_E = I_e$ = 0; V_{CB} = 5 V	C_c	<	1.5	pF

Feedback capacitance at f = 1 MHz [1]

I_C = 2 mA; V_{CE} = 5 V	$-C_{re}$	typ.	0.8	pF

Noise figure [1]

I_C = 2 mA; V_{CE} = 5 V f = 500 MHz; R_S = 50 Ω	F	<	5	dB

Power gain (not neutralized) [1]

		f = 200	800	MHz
I_C = 30 mA; V_{CE} = 5 V; T_{amb} = 25 °C	G_p	> 19		dB
		typ. 21	7.5	dB

Intermodulation distortion [1]

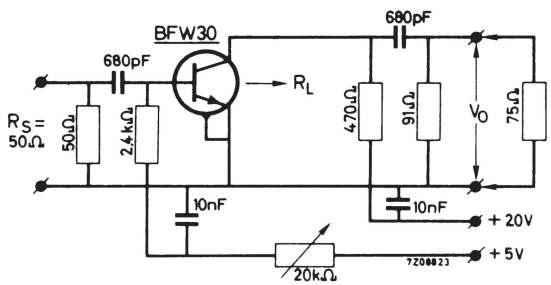
I_C = 30 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C

V_o = 100 mV at f_p = 183 MHz

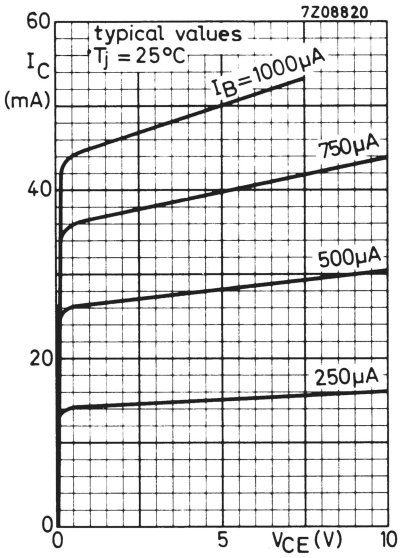
V_o = 100 mV at f_q = 200 MHz
measured at $f_{(2q-p)}$ = 217 MHz

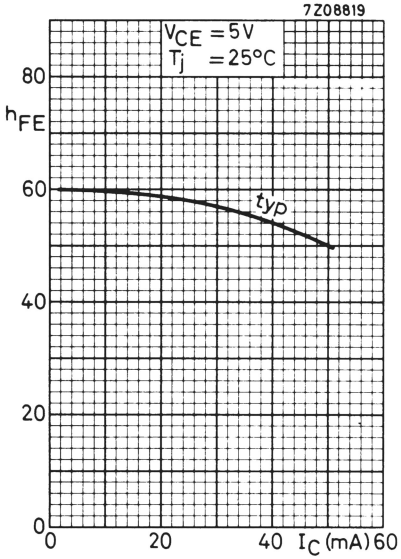
	d_{im}	typ.	-60	dB

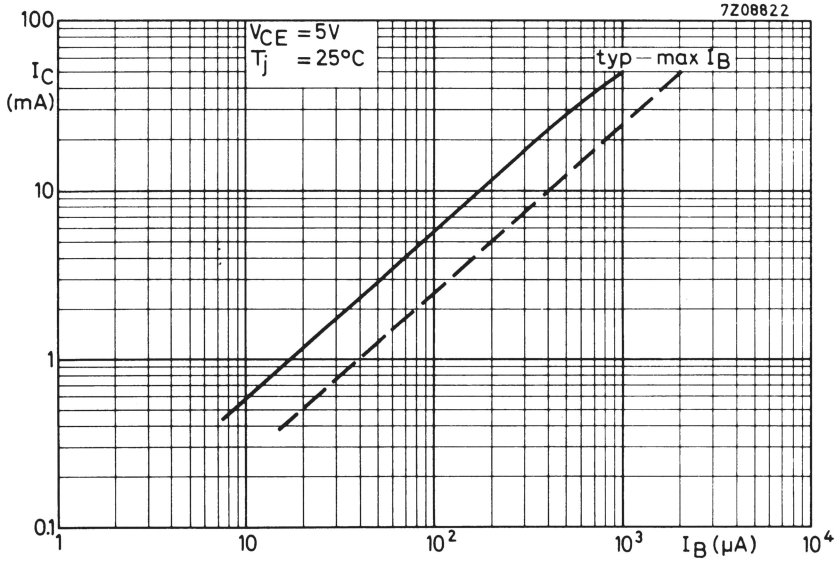
Test circuit

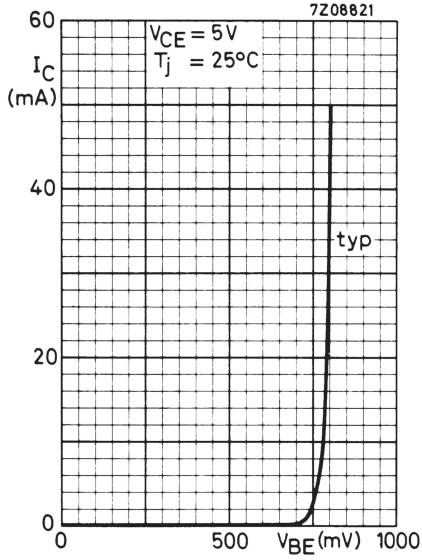


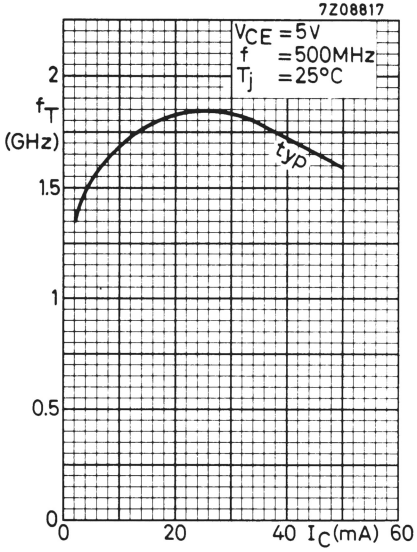
1) Shield lead grounded.
2) Shield lead not connected.

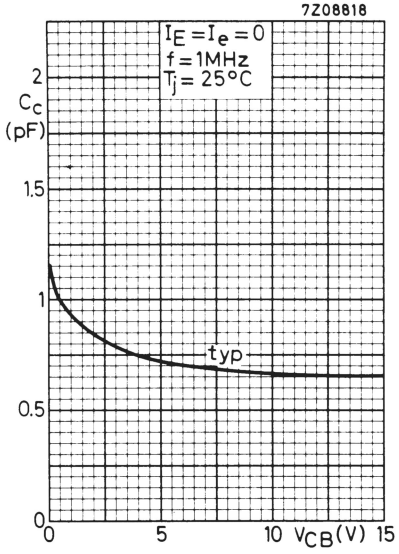

7Z08820
typical values
Tj = 25°C
IB=1000µA
750µA
500µA
250µA
IC (mA)
VCE (V)
0
5
10
20
40
60


7Z08819
VCE = 5V
Tj = 25°C
typ
hFE
IC (mA)
0
20
40
60
80


7Z08822
VCE = 5V
Tj = 25°C
typ — max IB
IC (mA)
IB (µA)
0.1
1
10
100
10²
10³
10⁴


7Z08821
60
I_C
(mA)
40
20
0
V_{CE} = 5V
T_j = 25°C
typ
0
500
V_{BE}(mV)
1000


7Z08817
V_{CE} = 5V
f = 500MHz
T_j = 25°C
2
f_T
(GHz)
1.5
1
0.5
0
typ
0
20
40
I_C(mA)
60


7Z08818
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
2
C_c
(pF)
1.5
1
0.5
0
typ
0
5
10
V_{CB}(V)
15

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic T-package. It has a low noise over a wide current range, a very high power gain and good intermodulation properties.
It is primarily intended for:
- Wideband aerial amplifiers (40 - 860 MHz)
- Channel and band aerial amplifiers for band I, II, III and IV/V (40 - 860 MHz)
- Television distribution amplifiers
- Low noise wideband vertical amplifier in high speed oscilloscopes

QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 73 °C	P_{tot}	max.	190	mW
Junction temperature	T_j	max.	150	°C
Transition frequency at f = 500 MHz				
I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	1,6	GHz
Feedback capacitance at f = 1 MHz				
I_C = 2 mA; V_{CE} = 5 V	C_{re}	typ.	0,6	pF
Noise figure at f = 500 MHz				
I_C = 2 mA; V_{CE} = 5 V	F	typ.	4	dB
		f =	200 | 800	MHz
Power gain (not neutralized)				
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	typ.	23 | 11	dB
Output power at d_{im} = −30 dB				
VSWR at output < 2; I_C = 10 mA; V_{CE} = 10 V	P_o	typ.	8 | 8	mW

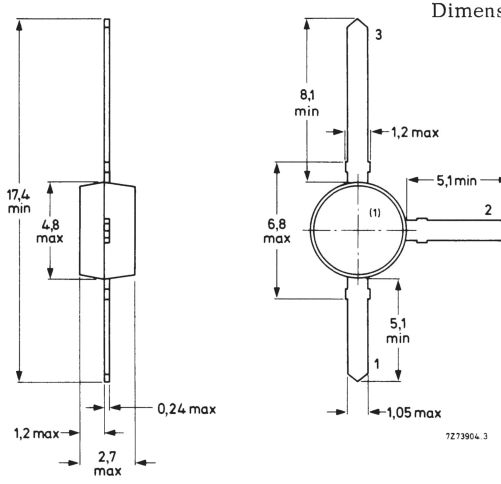
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

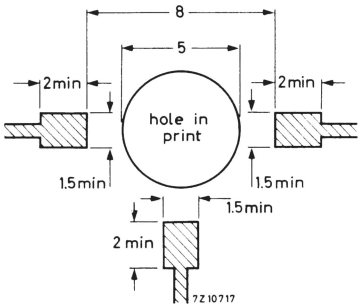
Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	25	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V [1]
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Currents				
Collector current (d.c.)	I_C	max.	25	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	50	mA
Power dissipation				
Total power dissipation up to T_{amb} = 73 °C	P_{tot}	max.	190	mW
Temperatures				
Storage temperature	T_{stg}	−65 to +150		°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print *) of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0.4	°C/mW

*) Requirements for glass-fibre print

(dimensions in mm)



1) At I_C = 10 mA

CHARACTERISTICS

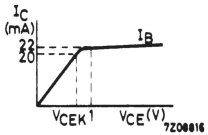
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA

Knee voltage [1])

I_C = 20 mA; I_B = value for which
I_C = 22 mA at V_{CE} = 1 V — V_{CEK} < 0.75 V



D.C. current gain

I_C = 2 mA; V_{CE} = 1 V	h_{FE}	>	20	
		<	150	
I_C = 25 mA; V_{CE} = 1 V [1])	h_{FE}	>	20	

Transition frequency at f = 500 MHz

I_C = 2 mA; V_{CE} = 5 V	f_T	typ.	1.0	GHz
I_C = 25 mA; V_{CE} = 5 V [1])	f_T	typ.	1.6	GHz

Collector capacitance at f = 1 MHz

$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ.	0.7	pF

Emitter capacitance at f = 1 MHz

$I_C = I_c$ = 0; V_{EB} = 0.5 V	C_e	typ.	1.5	pF

Feedback capacitance at f = 1 MHz

I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	$-C_{re}$	typ.	0.6	pF

Noise figure at f = 500 MHz

I_C = 2 mA; V_{CE} = 5 V; R_S = 50 Ω; T_{amb} = 25 °C	F	typ.	4.0	dB

Power gain (not neutralized)

		f = 200	800	MHz
I_C = 10 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	typ. 23	11	dB

[1]) Measured under pulsed conditions.

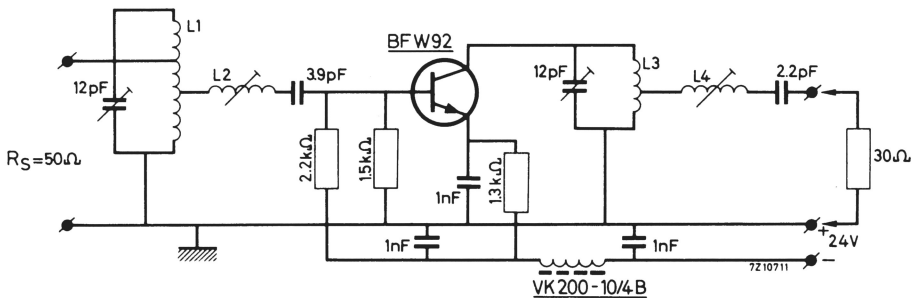
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics

1. Output power at f = 200 MHz; T_{amb} = 25 °C

   I_C = 10 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
   f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
   measured at $f_{(2q-p)}$ = 208 MHz (Channel 9) P_o typ. 8 mW

   Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
R_L = 820 Ω; C_L = −1.0 pF

Adjustment procedure

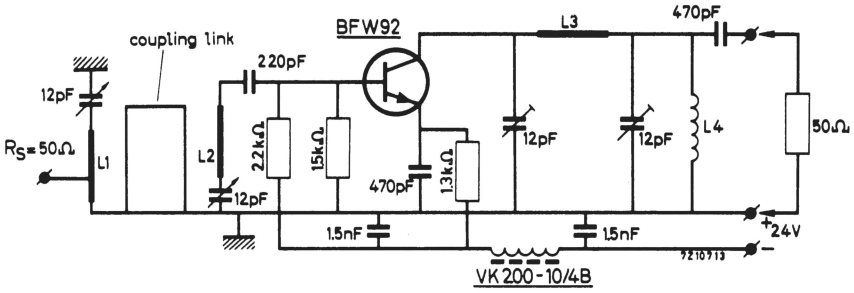
1. Remove the transistor and connect a dummy consisting of a 820 Ω resistor in parallel with a 1.0 pF capacitor between the collector and emitter connections of the output circuit.
2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.
3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics

2. Output power at f = 800 MHz; T_{amb} = 25 °C

I_C = 10 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o typ. 8 mW



Coil data:
L1 = 24 mm x 6 mm x 0.5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated Cu strip.
L3 = 20 mm x 8 mm x 0.5 mm silver plated Cu strip.
L4 = 4 turns enamelled Cu wire (0.5 mm); winding pitch 1.5 mm; int. diam. 4 mm
Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearily with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} = 40 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 40 mW.
After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output is then ≤ 2 over the whole channel.

CHARACTERISTICS (continued)

Intermodulation characteristics

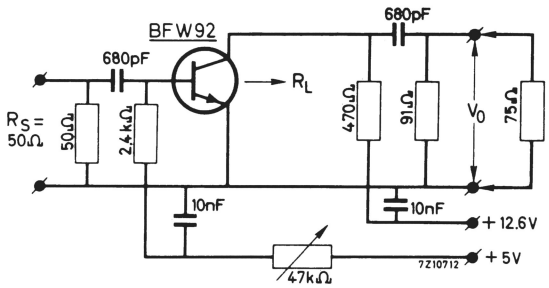
3. Intermodulation distortion

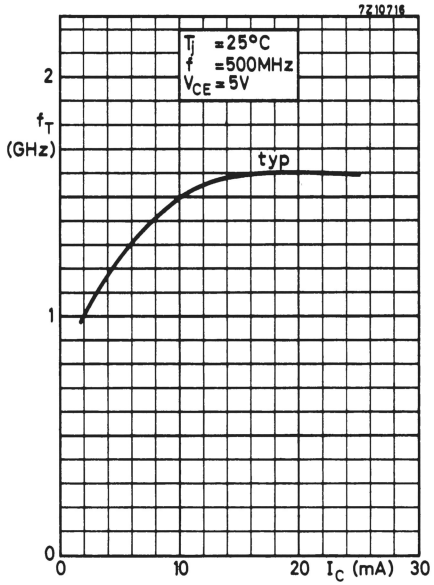
I_C = 10 mA; V_{CE} = 6 V; R_L = 37.5Ω; T_{amb} = 25 °C

V_0 = 100 mV at f_p = 183 MHz

V_0 = 100 mV at f_q = 200 MHz
measured at $f_{(2q-p)}$ = 217 MHz $\quad d_{im}$ typ. −45 dB

Test circuit:




7Z10716
Tj =25°C
f =500MHz
VCE =5V
typ
fT (GHz)
2
1
0
0
10
20
IC (mA)
30

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature T-package primarily intended for use in amplifiers in the 40-860 MHz range. The BFW92A is the successor to the BFW92 and offers higher power gain and improved noise behaviour.

QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	25 mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	150 °C
Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2,8 GHz
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,45 pF
Noise figure at f = 800 MHz I_C = 2 mA; V_{CE} = 5 V; R_S = 60 Ω	F	typ.	2,5 dB
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	13 dB
Output voltage at d_{im} = –60 dB (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω $f_{(p+q-r)}$ = 793,25 MHz	V_O	typ.	150 mV

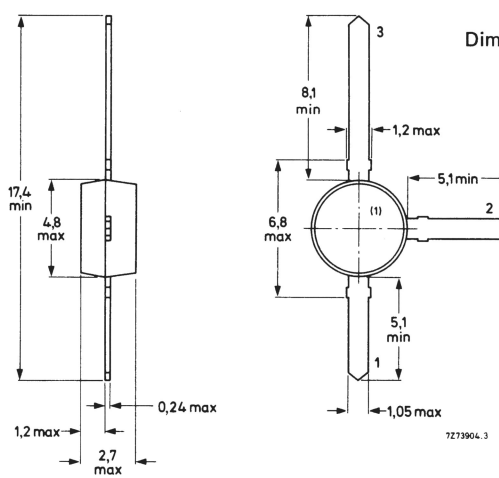
MECHANICAL DATA

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector

(1) Type number marking.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	25 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5 V
Collector current (d.c.)	I_C	max.	25 mA
Collector current (peak)	I_{CM}	max.	50 mA
Total power dissipation up to T_{amb} = 70 °C	P_{tot}	max.	200 mW
Storage temperature	T_{stg}	−65 to +	150 °C
Junction temperature	T_j	max.	150 °C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a fibre-glass print (see Fig. 2) of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	400 K/W*

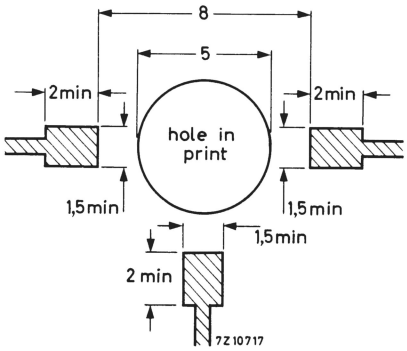


Fig. 2 Requirements for fibre-glass print (dimensions in mm).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current			
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50 nA
D.C. current gain			
I_C = 2 mA; V_{CE} = 1 V	h_{FE}	>	20
		<	150
I_C = 25 mA; V_{CE} = 1 V	h_{FE}	>	20

* K/W is SI unit for °C/W.

Transition frequency at f = 500 MHz I_C = 25 mA; V_{CE} = 5 V	f_T	typ.	2,8 GHz
Collector capacitance at f = 1 MHz I_E = 0; V_{CB} = 10 V	C_c	typ.	0,8 pF
Emitter capacitance at f = 1 MHz I_C = 0; V_{EB} = 0,5 V	C_e	typ.	1,4 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 5 V	C_{re}	typ.	0,45 pF
Noise figure at f = 800 MHz and T_{amb} = 25 °C I_C = 2 mA; V_{CE} = 5 V; R_S = 60 Ω	F	typ.	2,5 dB
Output voltage at d_{im} = −60 dB (see Fig. 3) I_C = 14 mA; V_{CE} = 10 V; R_L = 75 Ω $V_p = V_o$ at d_{im} = −60 dB; f_p = 795,25 MHz $V_q = V_o$ −6 dB ; f_q = 803,25 MHz $V_r = V_o$ −6 dB ; f_r = 805,25 MHz Measured at $f_{(p+q-r)}$ = 793,25 MHz	V_o	typ.	150 mV
Maximum unilateral power gain at f = 800 MHz I_C = 14 mA; V_{CE} = 10 V	G_{UM}	typ.	13 dB

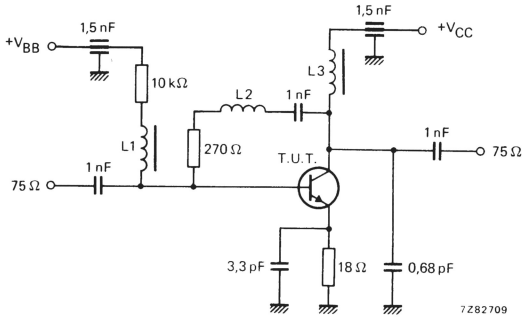


Fig. 3 Intermodulation distortion and second harmonic distortion MATV test circuit.

L1 = L3 = 5 μH microchoke
L2 = 3 turns Cu wire (0,4 mm); internal diameter 3 mm; winding pitch 1 mm

S-parameters (common emitter) at I_C = 14 mA; V_{CE} = 10 V

f MHz	s_{ie}	s_{re}	s_{fe}	s_{oe}
40	0,56/ −30°	0,01/76°	27,5/156°	0,94/ 10°
100	0,42/ −64°	0,02/69°	20,4/131°	0,81/−17°
200	0,28/−100°	0,03/68°	12,7/109°	0,70/−19°
500	0,18/−161°	0,05/74°	5,7/ 87°	0,63/−23°
800	0,18/+163°	0,08/75°	3,6/ 74°	0,63/−31°
1000	0,19/+145°	0,10/75°	2,9/ 66°	0,62/−36°

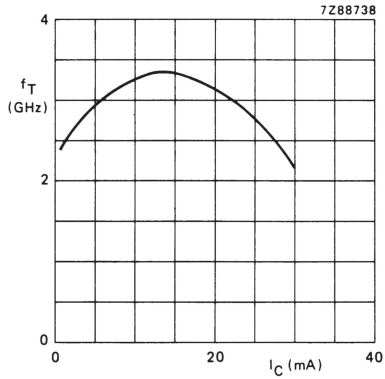


Fig. 4 V_{CE} = 5 V; f = 500 MHz; T_j = 25 °C.

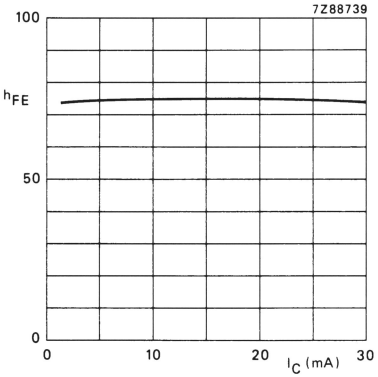


Fig. 5 V_{CE} = 5 V; T_j = 25 °C.

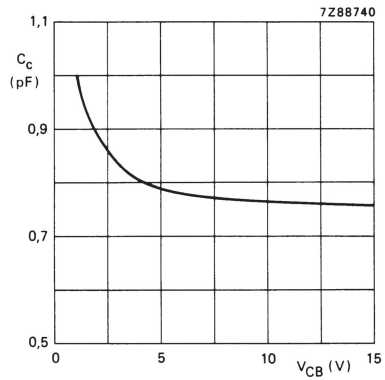


Fig. 6 T_j = 25 °C.

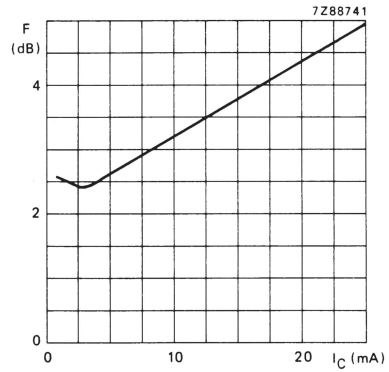


Fig. 7 V_{CE} = 5 V; T_{amb} = 25 °C; f = 800 MHz; R_S = 60 Ω.

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a subminiature plastic transfer-moulded T-package.
The device is intended for use in v.h.f. - u.h.f. applications, primarily wideband aerial amplifiers 40 - 800 MHz.
It is intended for mounting on miniature printed-circuit boards.

QUICK REFERENCE DATA				
Collector-base voltage (open emitter)	V_{CBO}	max.	18	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA
Total power dissipation up to T_{amb} = 73 °C	P_{tot}	max.	190	mW
Junction temperature	T_j	max.	150	°C
Feedback capacitance at f = 1 MHz				
I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	C_{re}	typ.	0,6	pF
Transition frequency at f = 500 MHz				
I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	1,7	GHz
Max. unilateral power gain				
I_C = 30 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	22	dB
I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	10,5	dB
Intermodulation distortion at T_{amb} = 25 °C				
I_C = 30 mA; V_{CE} = 5 V; R_L = 37,5 Ω				
V_O = 100 mV at f_p = 183 MHz				
V_O = 100 mV at f_q = 200 MHz				
measured at $f_{(2q-p)}$ = 217 MHz	d_{im}	typ.	−60	dB

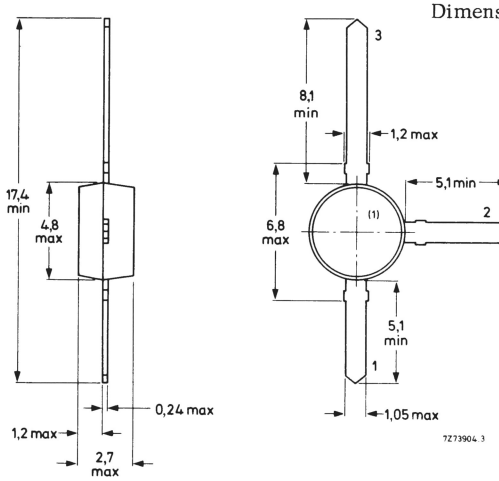
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-37.

Connections

1. Base
2. Emitter
3. Collector



(1) = type number marking.

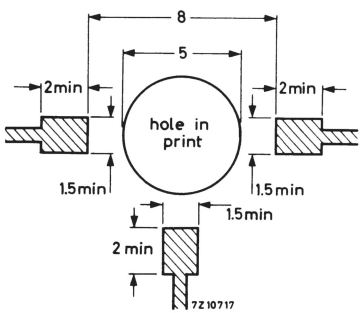
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter)	V_{CBO}	max.	18	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Currents				
Collector current (d.c.)	I_C	max.	50	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	100	mA
Power dissipation				
Total power dissipation up to T_{amb} = 73 °C	P_{tot}	max.	190	mW
Temperatures				
Storage temperature	T_{stg}	−65 to	+150	°C
Junction temperature	T_j	max.	150	°C

THERMAL RESISTANCE

From junction to ambient in free air mounted on a glass-fibre print of 40 mm x 25 mm x 1 mm	$R_{th\ j\text{-}a}$	=	0.4	°C/mW

Requirements for glass-fibre print (dimensions in mm)



CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_E = 0; V_{CB} = 10 V	I_{CBO}	<	50	nA
D.C. current gain [1]				
I_C = 25 mA; V_{CE} = 5 V	h_{FE}	>	25	
I_C = 50 mA; V_{CE} = 5 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz [1]				
I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	1.7	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 5 V	C_c	typ.	0.7	pF
Emitter capacitance at f = 1 MHz				
$I_C = I_c$ = 0; V_{EB} = 0.5 V	C_e	typ.	1.5	pF
Feedback capacitance at f = 1 MHz				
I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	$-C_{re}$	typ.	0.6	pF
Noise figure at f = 500 MHz				
I_C = 2 mA; V_{CE} = 5 V; G_S = 20 mA/V				
B_S is tuned; T_{amb} = 25 °C	F	<	5	dB

Max. unilateral power gain (s_{re} assumed to be zero)

$$G_{UM} \text{ (in dB)} = 10 \log \frac{|s_{fe}|^2}{(1 - |s_{ie}|^2)(1 - |s_{oe}|^2)}$$

I_C = 30 mA; V_{CE} = 5 V; f = 200 MHz; T_{amb} = 25 °C	G_{UM}	typ.	22	dB
I_C = 30 mA; V_{CE} = 5 V; f = 800 MHz; T_{amb} = 25 °C	G_{UM}	typ.	10.5	dB

1) Measured under pulse conditions.

CHARACTERISTICS (continued)

Intermodulation distortion at T_{amb} = 25 °C

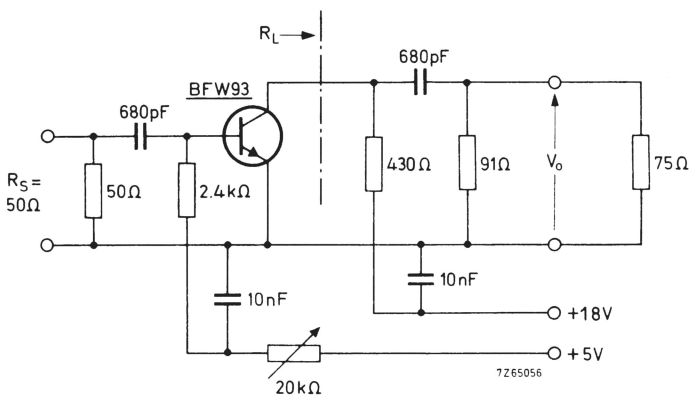
I_C = 30 mA; V_{CE} = 5 V; R_L = 37.5 Ω

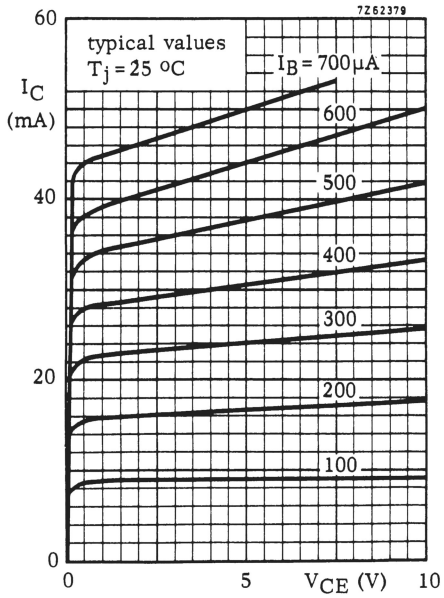
V_o = 100 mV at f_p = 183 MHz

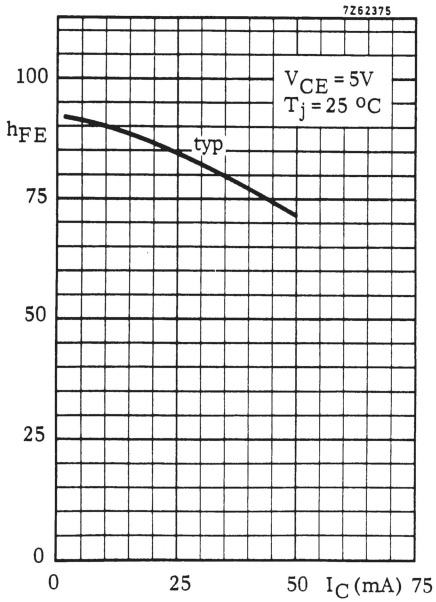
V_o = 100 mV at f_q = 200 MHz

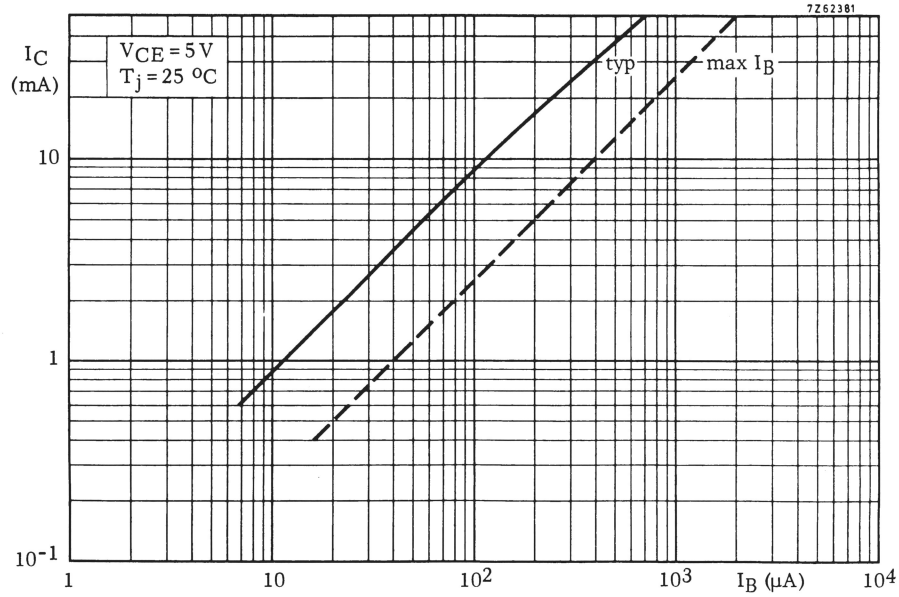
measured at $f_{(2q-p)}$ = 217 MHz d_{im} typ. −60 dB

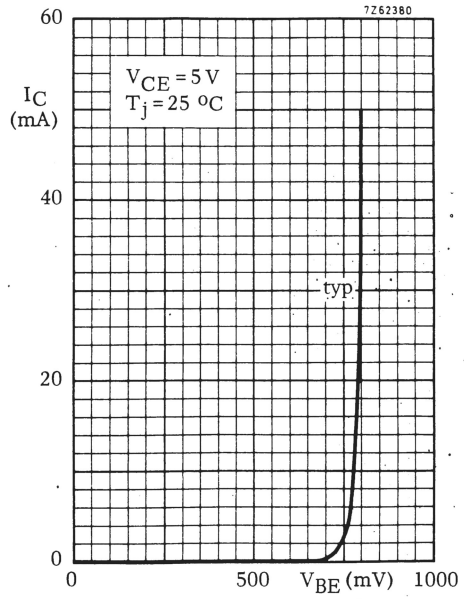
Test circuit:

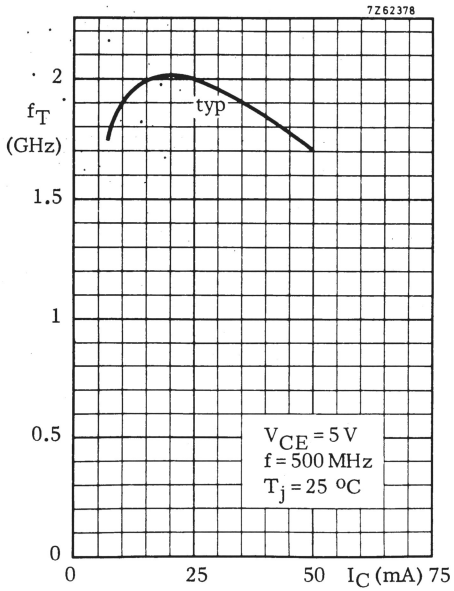


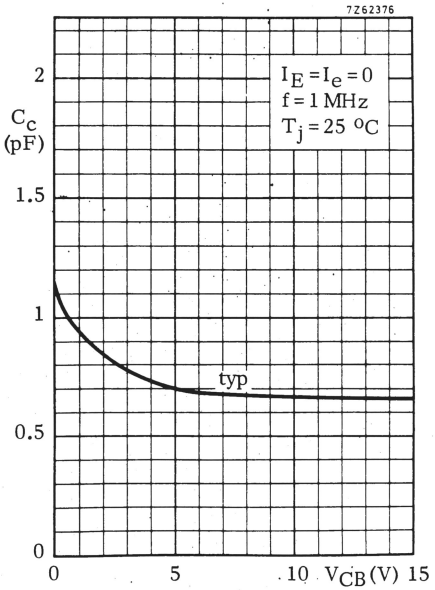

7Z62379
typical values
T_j = 25 °C
I_B = 700 µA
600
500
400
300
200
100
I_C (mA)
60
40
20
0
0
5
V_{CE} (V)
10


7Z62375
V_{CE} = 5V
T_j = 25 °C
typ
h_{FE}
100
75
50
25
0
0
25
50
I_C (mA)
75

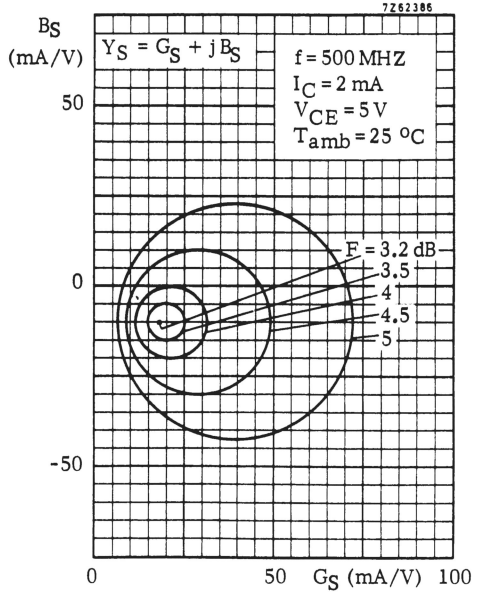

7Z62381
V_{CE} = 5V
T_j = 25 °C
typ
max I_B
I_C (mA)
10
1
10^{-1}
1
10
10^2
10^3
I_B (µA)
10^4

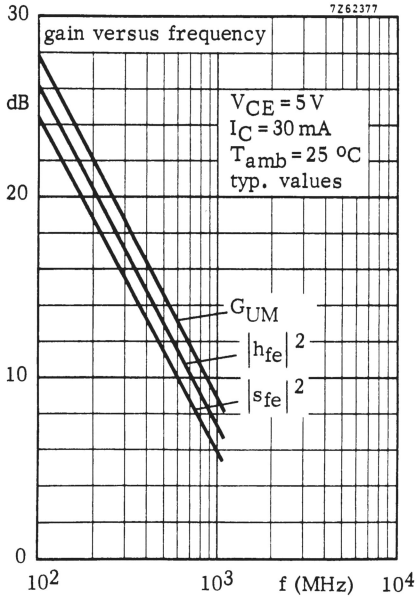

7Z62380
60
40
20
0
I_C (mA)
V_{CE} = 5 V
T_j = 25 °C
typ
0
500
V_{BE} (mV)
1000

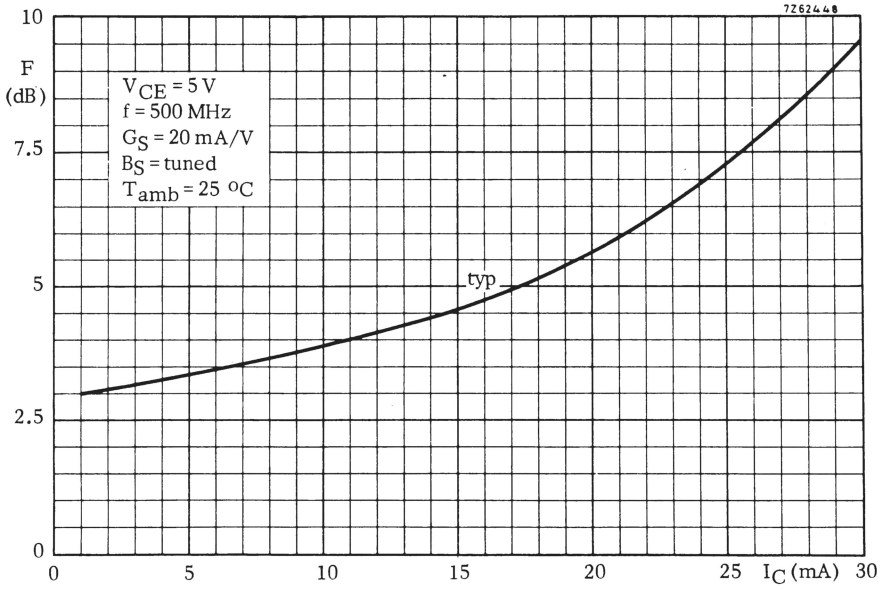

7Z62378
2
1.5
1
0.5
0
f_T (GHz)
typ
V_{CE} = 5 V
f = 500 MHz
T_j = 25 °C
0
25
50
I_C (mA)
75


7Z62376
2
1.5
1
0.5
0
C_c (pF)
$I_E = I_e = 0$
f = 1 MHz
T_j = 25 °C
typ
0
5
10
V_{CB} (V)
15

circles of constant noise figure



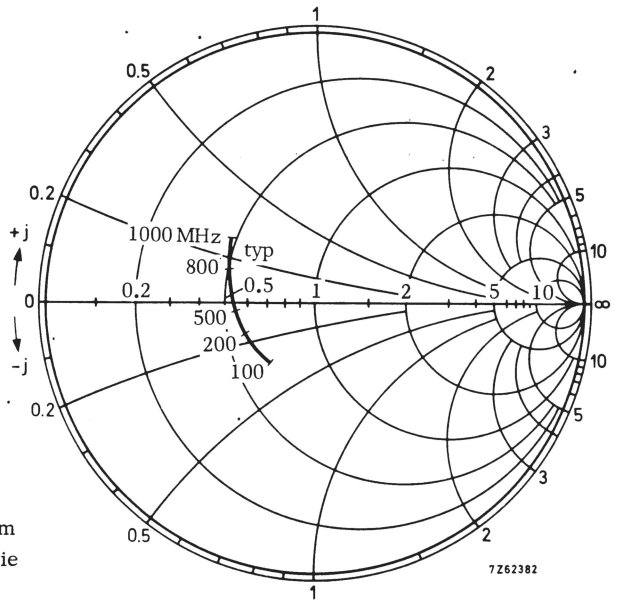




V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

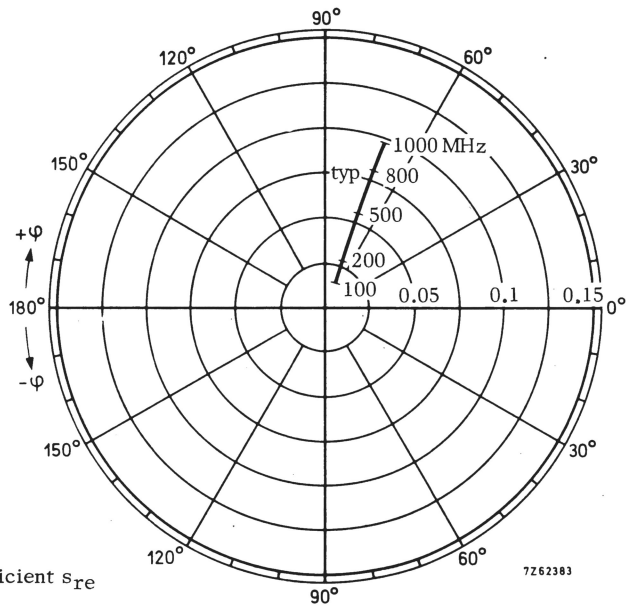


Input impedance derived from input reflection coefficient s_{ie} coordinates in ohm x 50

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

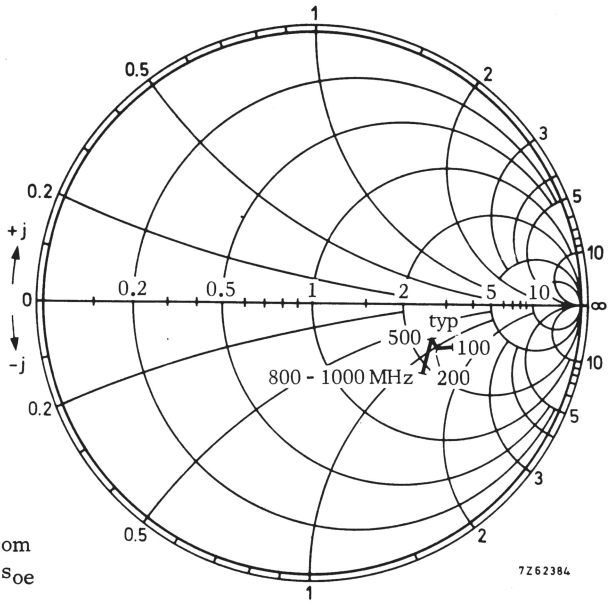


Reverse transmission coefficient s_{re}

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C

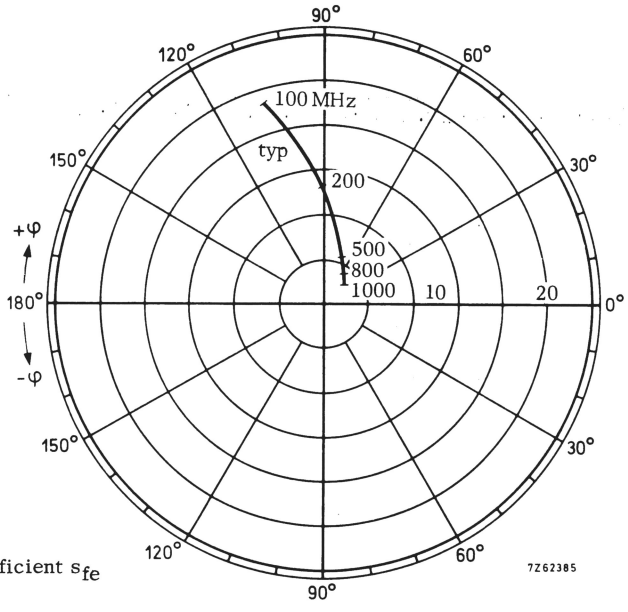


Output impedance derived from output reflection coefficient s_{oe} coordinates in ohm x 50

V_{CE} = 5 V

I_C = 30 mA

T_{amb} = 25 °C



Forward transmission coefficient s_{fe}

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope, with insulated electrodes and a shield lead connected to the case. The transistor has a low noise, a very high power gain and good intermodulation properties. It is primarily intended for:

– Channel aerial amplifiers for bands I, II, III and IV/V (40–860 MHz).
– Wideband aerial amplifiers (40–860 MHz).

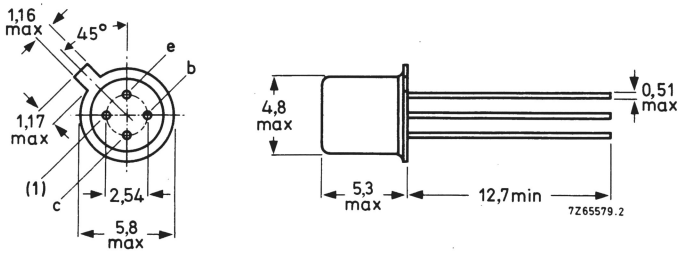
QUICK REFERENCE DATA

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.		30	V
Collector-emitter voltage (open base)	V_{CEO}	max.		15	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.		50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.		200	mW
Junction temperature	T_j	max.		200	°C
Transition frequency I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.		1,2	GHz
Feedback capacitance I_C = 2 mA; V_{CE} = 5 V; f = 1 MHz	C_{re}	typ.		0,6	pF
			f = 200	800	MHz
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V	F	typ.	3,3	7	dB
Power gain (not neutralized) I_C = 8 mA; V_{CE} = 10 V	G_p	typ.	22	7	dB
Output power d_{im} = –30 dB; VSWR at output < 2; I_C = 8 mA; V_{CE} = 10 V	P_o	typ.	6	6	mW

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (peak value) $R_{BE} \leq 50\ \Omega$	V_{CERM}	max.	30	V [1]
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V [1]
Emitter-base voltage (open collector)	V_{EBO}	max.	2.5	V
Currents				
Collector current (d.c.)	I_C	max.	25	mA
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	50	mA
Power dissipation				
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW
Temperatures				
Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0.88	°C/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0.58	°C/mW

[1]) I_C = 10 mA.

CHARACTERISTICS

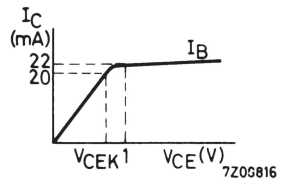
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 15 V	I_{CBO}	<	10	nA

Knee voltage

I_C = 20 mA; I_B = value for which I_C = 22 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 2 mA; V_{CE} = 1 V	h_{FE}	20 to 150		
I_C = 25 mA; V_{CE} = 1 V	h_{FE}	20 to 125		

Transition frequency [1]

I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.0	GHz
I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.2	GHz

Collector capacitance at f = 1 MHz [2]

$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	<	1.7	pF

Feedback capacitance at f = 1 MHz [1]

I_C = 2 mA; V_{CE} = 5 V	$-C_{re}$	typ.	0.6	pF

Noise figure [1]

I_C = 2 mA; V_{CE} = 5 V				
f = 200 MHz; optimum source impedance	F	<	4	dB
f = 500 MHz; R_S = 50 Ω	F	<	6.5	dB
f = 800 MHz; optimum source impedance	F	typ.	7.0	dB

Power gain (not neutralized) [1]

			f = 200	800	MHz
I_C = 8 mA; V_{CE} = 10 V; T_{amb} = 25 °C	G_p	>	19	–	dB
		typ.	22	7	dB

1) Shield lead grounded.
2) Shield lead not connected.

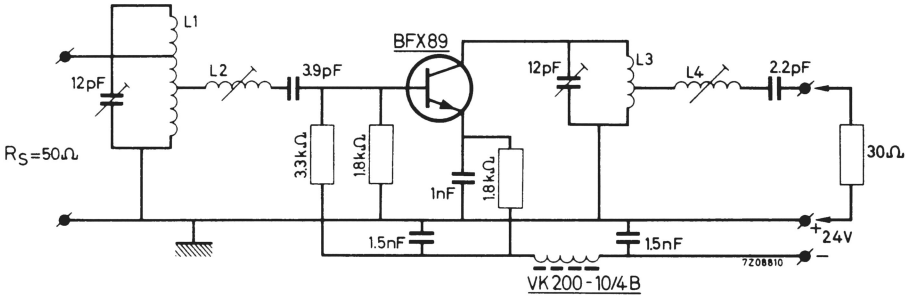
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 8 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9) P_o typ. 6 mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm) winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm) winding pitch 2.2 mm; int. diam. 11 mm.

1) Shield lead grounded.

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if

$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$

   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 1\ k\Omega$; $C_L = -1.8$ pF

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 1 kΩ resistor in parallel with a 1.8 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1).
   After this adjustment, no further change may be made in the output circuit.

3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

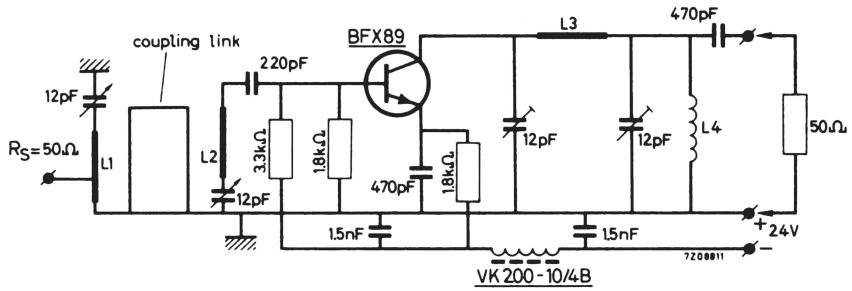
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

2. Output power at f = 800 MHz; T_{amb} = 25 °C

I_C = 8 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o typ. 6 mW

Test circuit:



Coil data:

L1 = 24 mm x 6 mm x 0.5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated Cu strip.
L3 = 20 mm x 8 mm x 0.5 mm silver plated Cu strip.
L4 = 4 turns enamelled Cu wire (0.5 mm); winding pitch 1.5 mm; int. diam. 4 mm.
Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearily with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} = 35 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 35 mW.
After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output is then ≤ 2 over the whole channel.

[1]) Shield lead grounded

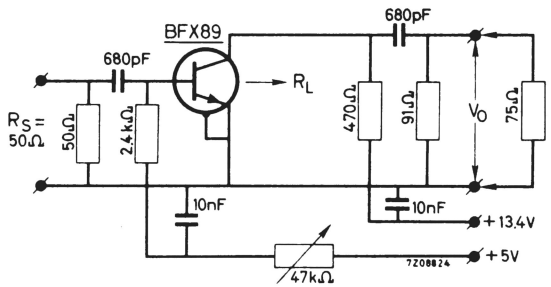
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

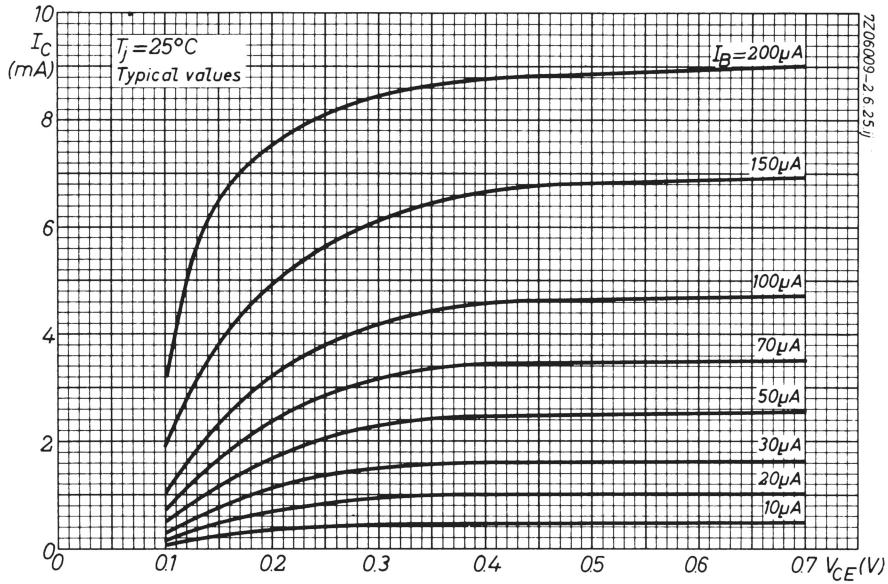
Intermodulation characteristics [1])

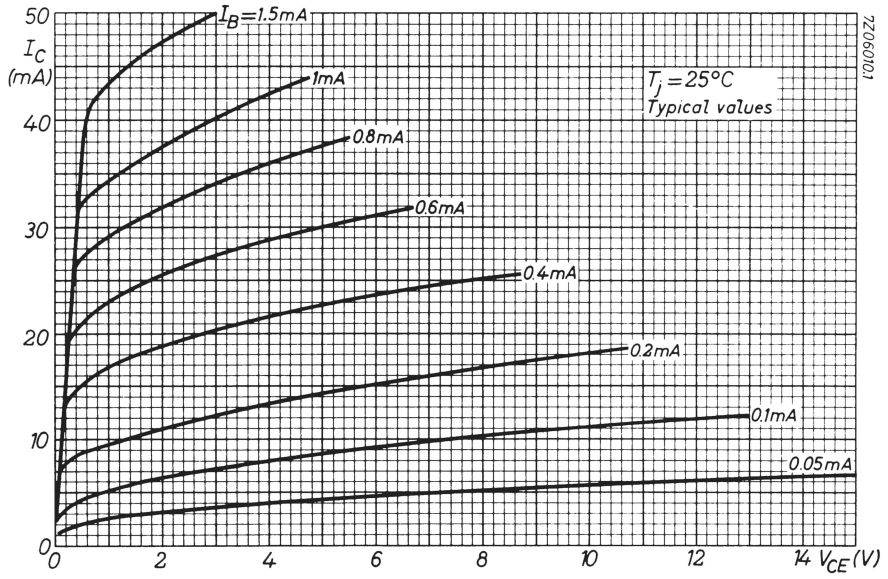
3. Intermodulation distortion

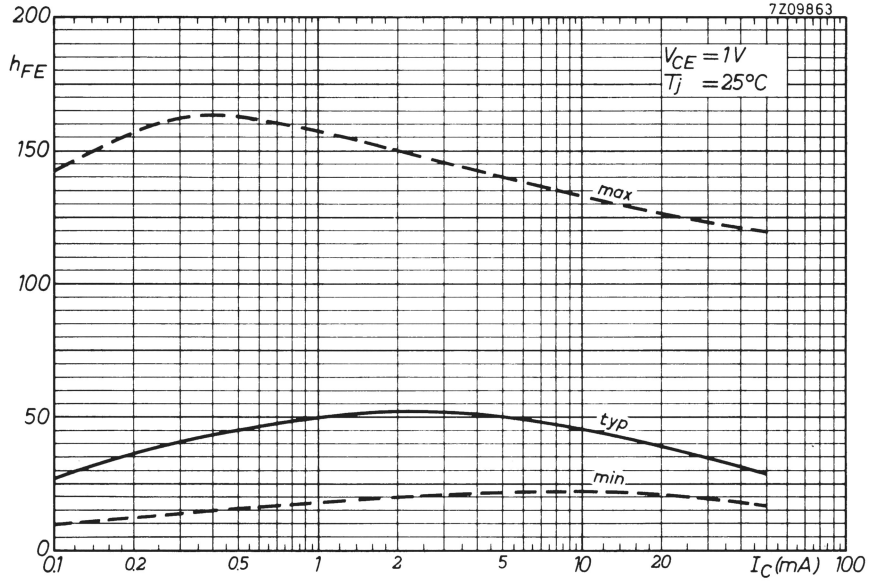
I_C = 8 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C
V_o = 100 mV at f_p = 183 MHz
V_o = 100 mV at f_q = 200 MHz
measured at $f_{(2q-p)}$ = 217 MHz d_{im} typ. −40 dB

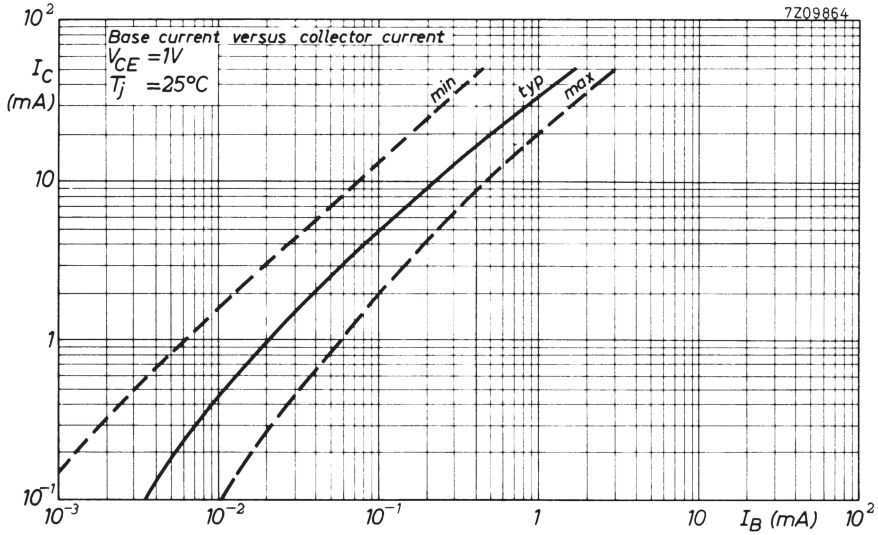
Test circuit:

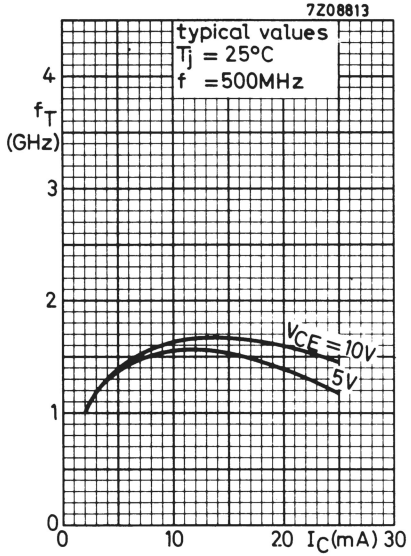


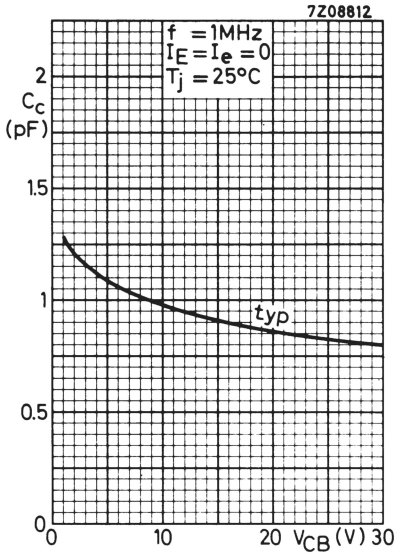

I_C (mA)
$T_j = 25°C$
Typical values
I_B=200μA
150μA
100μA
70μA
50μA
30μA
20μA
10μA
0
2
4
6
8
10
0.1
0.2
0.3
0.4
0.5
0.6
0.7
V_{CE}(V)
2206006-2.9.25

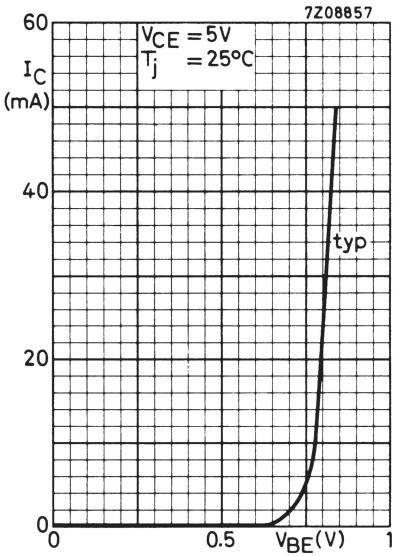

I_C (mA)
I_B=1.5mA
1mA
0.8mA
0.6mA
0.4mA
0.2mA
0.1mA
0.05mA
$T_j = 25°C$
Typical values
0
10
20
30
40
50
2
4
6
8
10
12
14
V_{CE}(V)
2206010

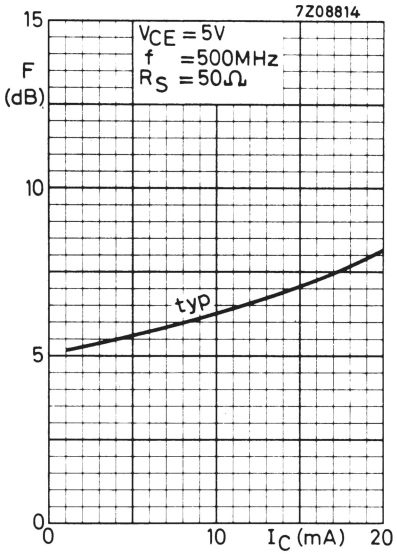

7Z09863
200
h_{FE}
150
100
50
0
0.1
0.2
0.5
1
2
5
10
20
I_C(mA)
100
V_{CE} = 1V
T_j = 25°C
max
typ
min

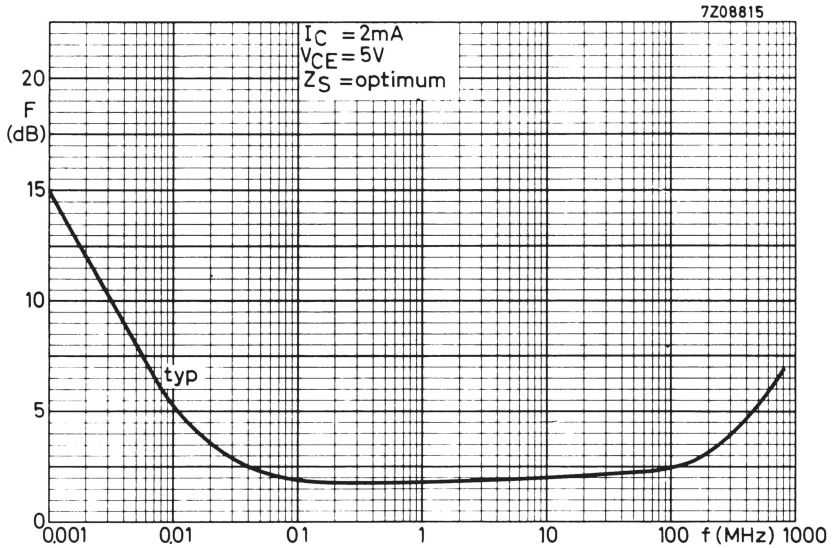

7Z09864
10^2
I_C
(mA)
10
1
10^{-1}
10^{-3}
10^{-2}
10^{-1}
1
10
I_B (mA)
10^2
Base current versus collector current
V_{CE} = 1V
T_j = 25°C
min
typ
max


7Z08813
typical values
T_j = 25°C
f = 500MHz
f_T (GHz)
4
3
2
1
0
V_{CE} = 10V
5V
0
10
20
I_C(mA)
30


7Z08812
f = 1MHz
$I_E = I_e = 0$
T_j = 25°C
C_c (pF)
2
1.5
1
0.5
0
typ
0
10
20
V_{CB} (V)
30


7Z08857
V_{CE} = 5V
T_j = 25°C
I_C (mA)
60
40
20
0
typ
0
0.5
V_{BE}(V)
1


7Z08814
15
F
(dB)
10
5
0
0
10
20
I_C (mA)
V_{CE} = 5V
f = 500MHz
R_S = 50Ω
typ


7Z08815
20
F
(dB)
15
10
5
0
0.001
0.01
0.1
1
10
100
f (MHz)
1000
I_C = 2mA
V_{CE} = 5V
Z_S = optimum
typ

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in a TO-72 metal envelope with insulated electrodes and a shield lead connected to the case.
The transistor has very low noise over a wide current range, a very high power gain and excellent intermodulation properties.

It is primarily intended for:

- Channel- and band aerial amplifiers for band I, II, III and IV/V (40-860 MHz)
- Wide band aerial amplifiers (40-860 MHz)
- Television distribution amplifiers
- Low noise wide band vertical amplifier in high speed oscilloscopes

It is also suitable for military- and industrial applications, such as:

- R.F. amplifiers and mixers for communication equipment
- Microwave telephony link systems, wide band i.f. amplifiers
- Large bandwidth radar i.f. amplifiers

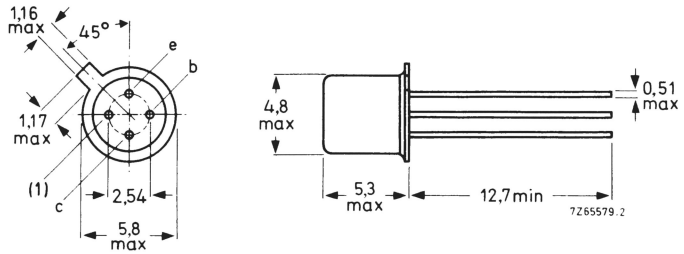
QUICK REFERENCE DATA				
Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (open base)	V_{CEO}	max.	15	V
Collector current (peak value; f > 1 MHz)	I_{CM}	max.	50	mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW
Junction temperature	T_j	max.	200	°C
Transition frequency I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1.4	GHz
Feedback capacitance at f = 1 MHz I_C = 2 mA; V_{CE} = 5 V	C_{re}	typ.	0.6	pF
Noise figure at optimum source impedance I_C = 2 mA; V_{CE} = 5 V	F	f = 200 typ. 2.5	800 5.5	MHz dB
Power gain (not neutralized) I_C = 14 mA; V_{CE} = 10 V	G_p	typ. 23	8	dB
Output power d_{im} = −30 dB; V.S.W.R. at output < 2 I_C = 14 mA; V_{CE} = 10 V	P_o	typ. 12	12	mW

MECHANICAL DATA (see next page)

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	30	V
Collector-emitter voltage (peak value) $R_{BE} \leqslant 50\,\Omega$; $I_C = 10$ mA	V_{CERM}	max.	30	V
Collector-emitter voltage (open base); $I_C = 10$ mA	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	2,5	V
Collector current (d.c.)	I_C	max.	25	mA
Collector current (peak value; $f > 1$ MHz)	I_{CM}	max.	50	mA
Total power dissipation up to $T_{amb} = 25\,^{o}C$	P_{tot}	max.	200	mW
Storage temperature	T_{stg}	−65 to +	200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	880	K/W*
From junction to case	$R_{th\ j\text{-}c}$	=	580	K/W*

* K/W is SI unit for °C/W.

CHARACTERISTICS

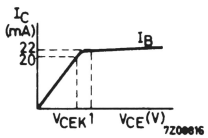
T_j = 25 °C unless otherwise specified

Collector cut-off current

I_E = 0; V_{CB} = 15 V	I_{CBO}	<	10	nA

Knee voltage

I_C = 20 mA; I_B = value for which I_C = 22 mA at V_{CE} = 1 V	V_{CEK}	<	0.75	V



D.C. current gain

I_C = 2 mA; V_{CE} = 1 V	h_{FE}	25 to 150		
I_C = 25 mA; V_{CE} = 1 V	h_{FE}	20 to 125		

Transition frequency [1]

I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz	f_T	>	1.0	GHz
		typ.	1.1	GHz
I_C = 25 mA; V_{CE} = 5 V; f = 500 MHz	f_T	>	1.3	GHz
		typ.	1.4	GHz

Collector capacitance at f = 1 MHz [2]

$I_E = I_e$ = 0; V_{CB} = 10 V	C_c	<	1.5	pF

Feedback capacitance at f = 1 MHz [1]

I_C = 2 mA; V_{CE} = 5 V	$-C_{re}$	typ.	0.6	pF
		<	0.8	pF

Noise figure [1]

I_C = 2 mA; V_{CE} = 5 V				
f = 100 kHz; optimum source resistance	F	<	4	dB
f = 200 MHz; optimum source impedance	F	<	3.5	dB
f = 500 MHz; R_S = 50 Ω	F	<	5	dB
f = 800 MHz; optimum source impedance	F	typ.	5.5	dB

Power gain (not neutralized) [1]

I_C = 14 mA; V_{CE} = 10 V; T_{amb} = 25 °C

		f = 200		800	MHz
G_p	>	21			dB
	typ.	**23**		8	dB

1) Shield lead grounded.

2) Shield lead not connected.

CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

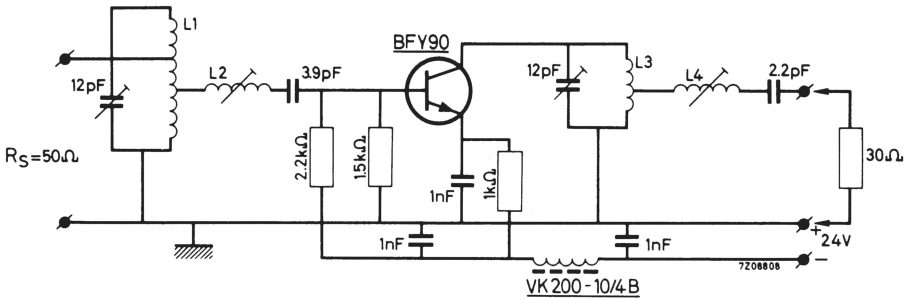
Intermodulation characteristics [1])

1. Output power at f = 200 MHz; T_{amb} = 25 °C

I_C = 14 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 202 MHz; f_q = 205 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 208 MHz (Channel 9)

P_o	>	10	mW
	typ.	12	mW

Test circuit:



Coil data:

L1 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 2.7 mm; int. diam. 8 mm; taps at 0.5 turn and 1.5 turns from earth.
L2 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 8 mm.
L3 = 3 turns silver plated Cu wire (1.4 mm); winding pitch 3.3 mm; int. diam. 8 mm.
L4 = 5.5 turns silver plated Cu wire (1.4 mm); winding pitch 2.2 mm; int. diam. 11 mm.

[1]) Shield lead grounded

CHARACTERISTICS (continued)

Basis of adjustment

The intermodulation at an intermodulation distortion of −30 dB is caused by h.f. output current - voltage clipping.
The maximum undistorted output power is realised, if

a. Current and voltage clipping take place concurrently.
   This occurs if
$$R_L = \frac{V_{CE} - V_{CEK}}{I_C},$$
   in which V_{CEK} is the high frequency knee voltage.

b. The h.f. collector current is as small as possible.
   This is so if $-C_L = +C_{oe}$,
   in which C_{oe} is the output capacitance of the transistor at short circuited input.

For maximum output power at an intermodulation distortion of −30 dB, the (experimentally found) values of R_L and C_L are:
$R_L = 560\ \Omega$; $C_L = -1.8$ pF

Adjustment procedure

1. Remove the transistor and connect a dummy consisting of a 560 Ω resistor in parallel with a 1.8 pF capacitor between the collector and emitter connections of the output circuit.

2. Tune and match the output circuit for zero reflection at 205 MHz (V.S.W.R. = 1). After this adjustment, no further change may be made in the output circuit.

3. Replace the dummy by the transistor. Tune and match the input circuit for maximum power gain and good band pass curve.
   The V.S.W.R. of the output will then, in most cases, be ≤ 2 over the whole channel.
   Corrections can be made by tuning L2; this will not disturb the band pass curve.

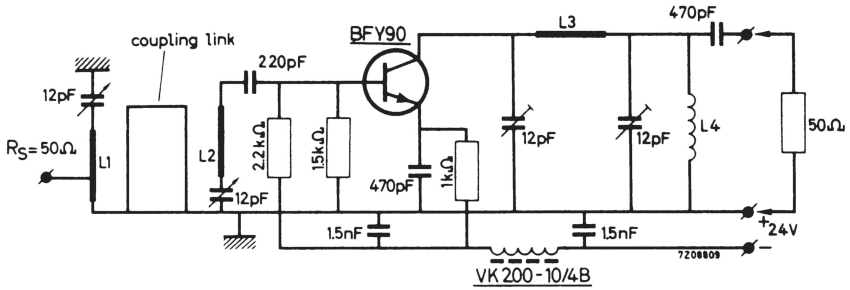
CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

2. Output power at f = 800 MHz; T_{amb} = 25 °C

I_C = 14 mA; V_{CE} = 10 V; V.S.W.R. at output < 2
f_p = 798 MHz; f_q = 802 MHz; d_{im} = −30 dB
measured at $f_{(2q-p)}$ = 806 MHz (Channel 62) P_o typ. 12 mW

Test circuit:



Coil data:

L1 = 24 mm x 6 mm x 0.5 mm silver plated Cu strip.
Tap of the input at 5 mm from earth.
L2 = 15 mm x 6 mm x 0.5 mm silver plated Cu strip.
L3 = 20 mm x 8 mm x 0.5 mm silver plated Cu strip.
L4 = 4 turns enamelled Cu wire (0.5 mm); winding pitch 1.5 mm; int. diam. 4 mm
Coupling link: 42 mm silver plated Cu wire (1 mm).

Basis of adjustment.

At 800 MHz no dummy can be used to adjust for optimum collector load because at these frequencies the impedance transformations of a dummy are too high. A small signal at the mid-channel frequency of 802 MHz is fed to the input and increased until clipping occurs; that is, until the output power no longer increases linearly with the input signal. This clipping can be eliminated by tuning the output circuit, thereby making the output power equal to

$$P_o = \frac{I_C (V_{CE} - V_{CEK})}{2} = 60 \text{ mW}$$

The output circuit is adjusted for minimum intermodulation if the input signal is as small as possible at P_o = 60 mW.
After this adjustment has been made no further change may be made in the output circuit.
Adjust the input circuit for maximum power gain and good band pass curve.
The V.S.W.R. of the output is then ≤ 2 over the whole channel.

[1]) Shield lead grounded

CHARACTERISTICS (continued) T_j = 25 °C unless otherwise specified

Intermodulation characteristics [1])

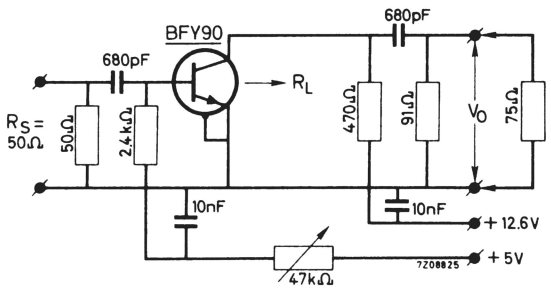
3. Intermodulation distortion

I_C = 14 mA; V_{CE} = 6 V; R_L = 37.5 Ω; T_{amb} = 25 °C

V_o = 100 mV at f_p = 183 MHz

V_o = 100 mV at f_q = 200 MHz
measured at $f_{(2q-p)}$ = 217 MHz d_{im} typ. −50 dB

Test circuit:



y parameters at f = 500 MHz (common emitter) [1])

I_C = 2 mA; V_{CE} = 5 V

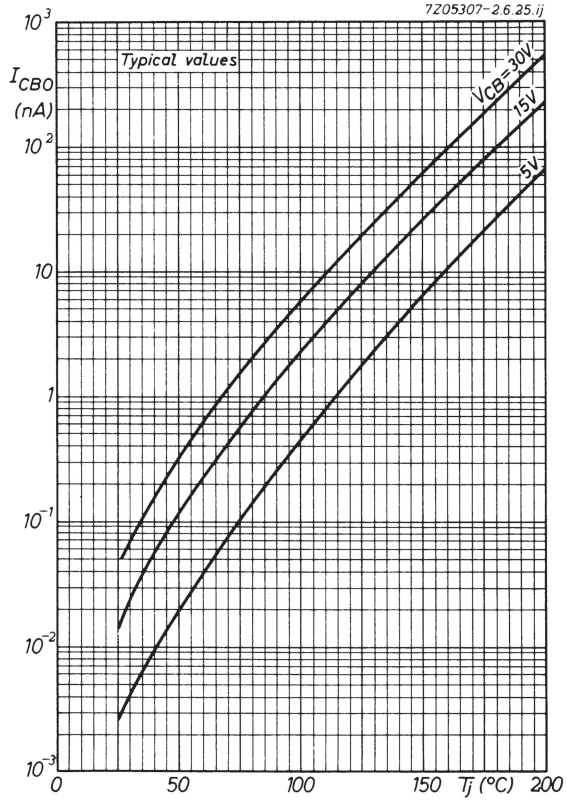
Input conductance	g_{ie}	typ.	16	$m\Omega^{-1}$
Input capacitance	C_{ie}	typ.	3.75	pF
Feedback admittance	$\|y_{re}\|$	typ.	1.55	$m\Omega^{-1}$
Phase angle of feedback admittance	φ_{re}	typ.	258°	
Transfer admittance	$\|y_{fe}\|$	typ.	45	$m\Omega^{-1}$
Phase angle of transfer admittance	φ_{fe}	typ.	285°	
Output conductance	g_{oe}	typ.	0.19	$m\Omega^{-1}$
Output capacitance	C_{oe}	typ.	1.9	pF

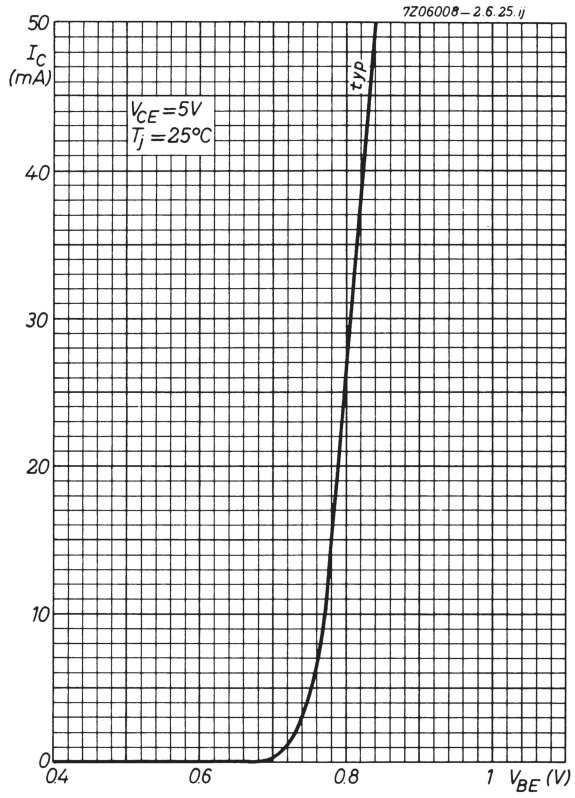
Maximum unilateralised power gain

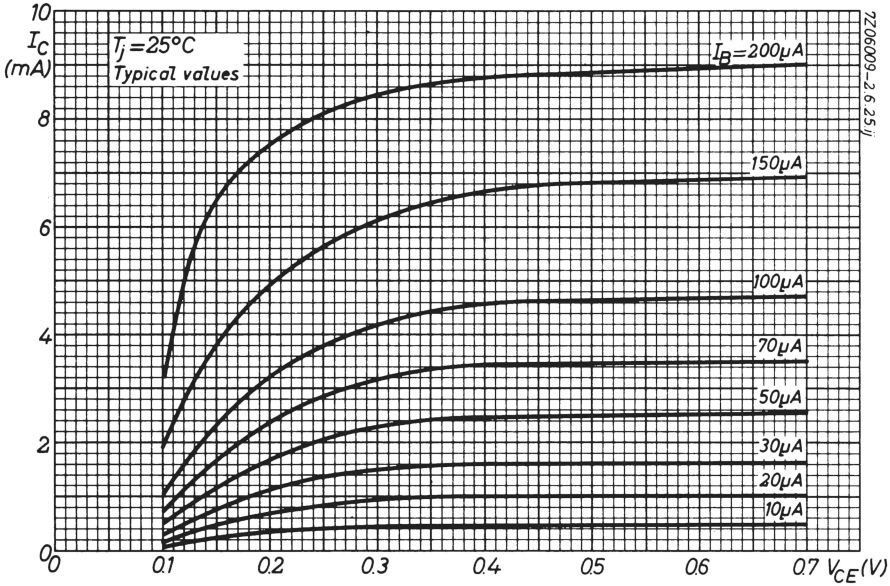
$$G_{UM} = \frac{|y_{fe}|^2}{4g_{ie}g_{oe}}$$

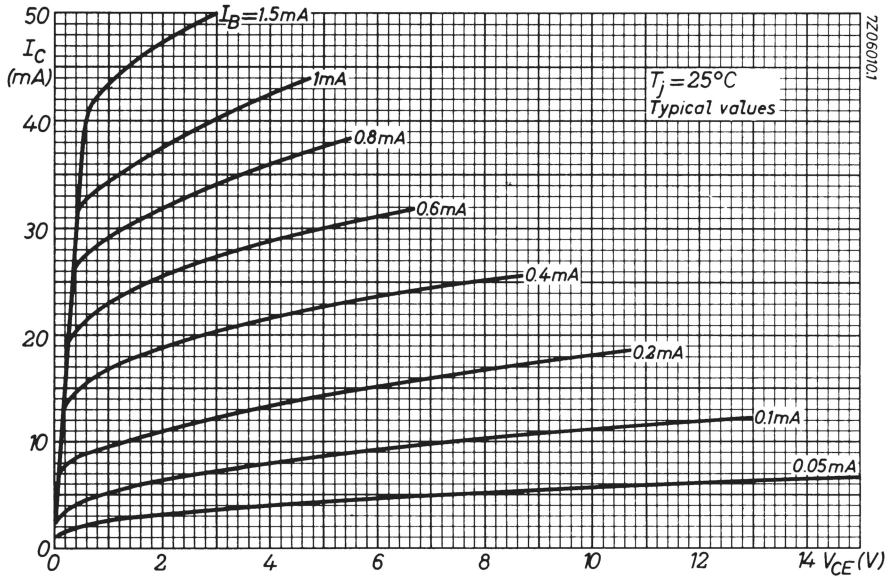
I_C = 2 mA; V_{CE} = 5 V; f = 500 MHz G_{UM} typ. 22 dB

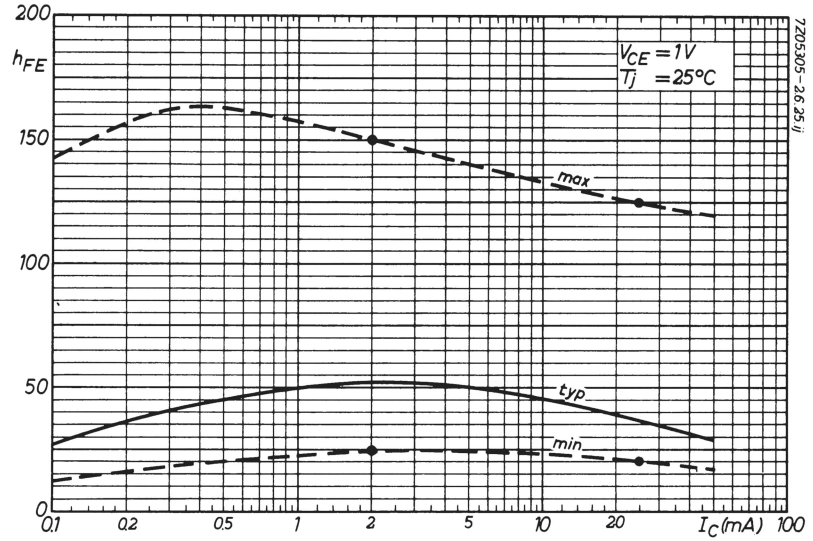
1) Shield lead grounded

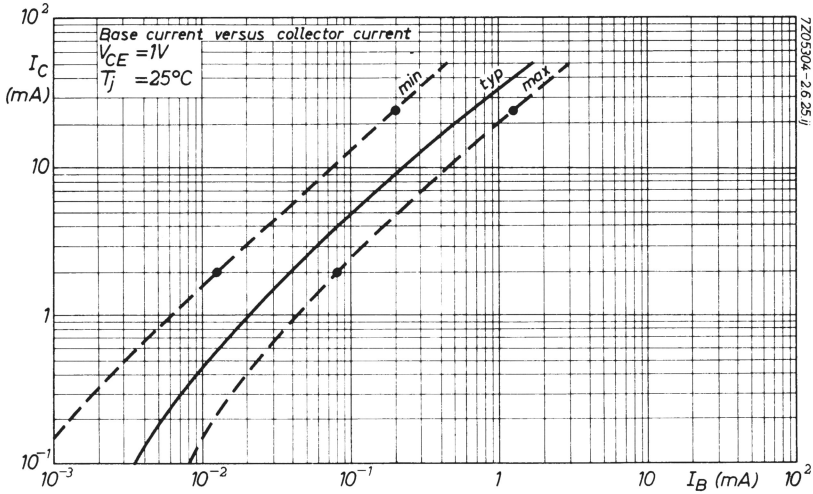

7Z05307-2.6.25.ij
Typical values
I_{CBO} (nA)
10^3
10^2
10
1
10^{-1}
10^{-2}
10^{-3}
V_{CB}=30V
15V
5V
0
50
100
150
Tj (°C)
200

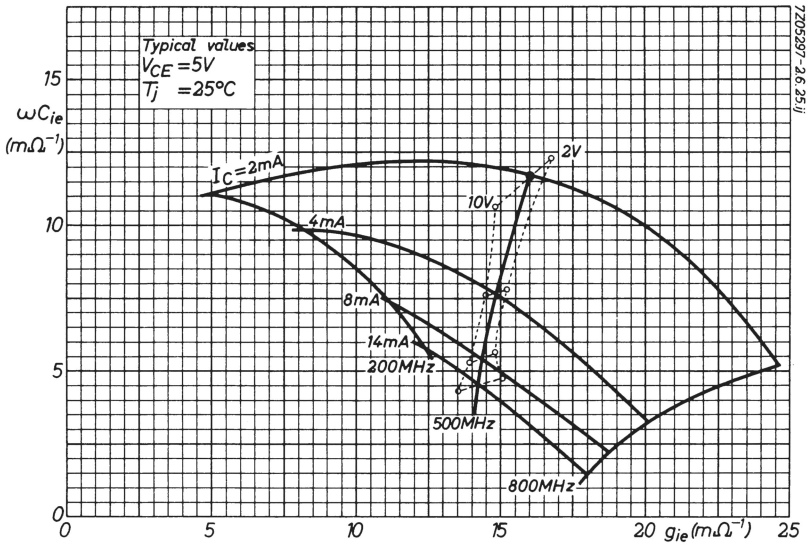

7Z06008—2.6.25.ij
50
I_C (mA)
40
30
20
10
0
typ
V_{CE}=5V
T_j=25°C
0.4
0.6
0.8
1
V_{BE} (V)

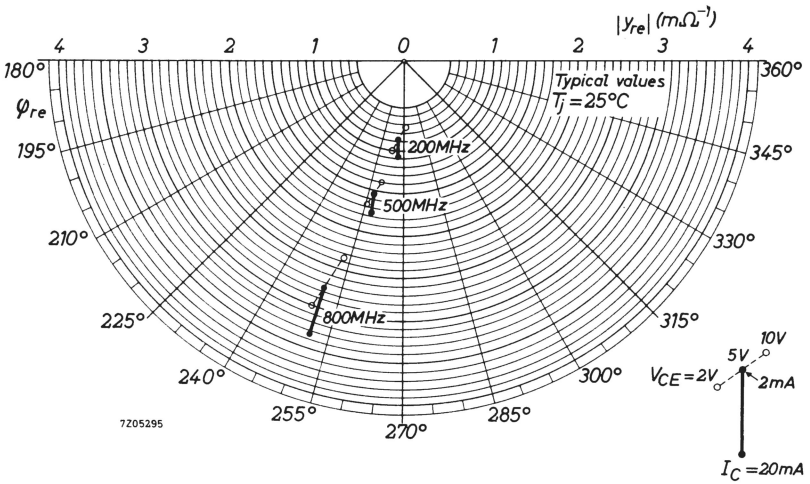

10
I_C
(mA)
T_j = 25°C
Typical values
I_B = 200μA
150μA
100μA
70μA
50μA
30μA
20μA
10μA
8
6
4
2
0
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7 V_{CE} (V)
7Z06009-2.6.25/j

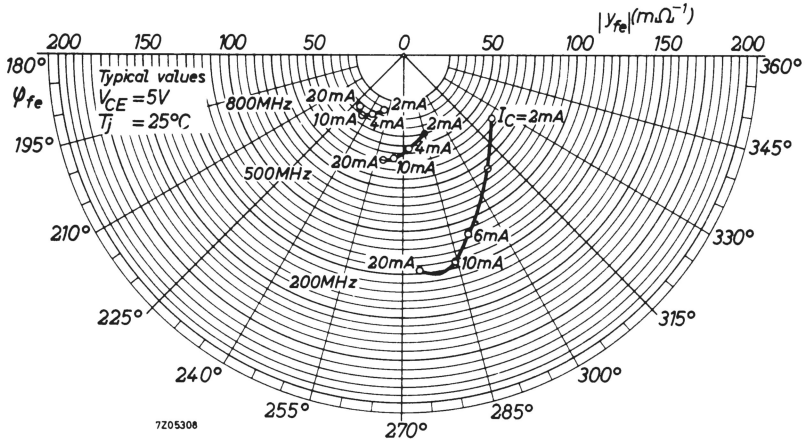

50
I_C
(mA)
I_B = 1.5mA
1mA
0.8mA
0.6mA
0.4mA
0.2mA
0.1mA
0.05mA
T_j = 25°C
Typical values
40
30
20
10
0
0
2
4
6
8
10
12
14 V_{CE} (V)
7Z06010.1

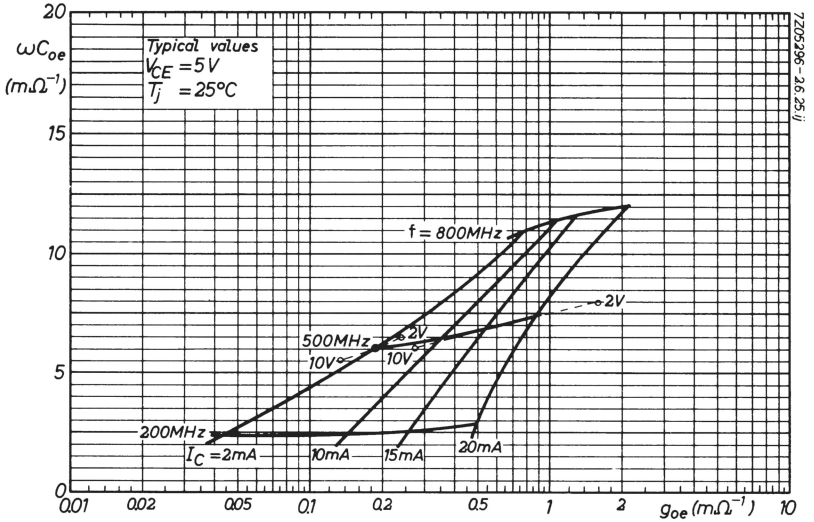

200
h_{FE}
150
100
50
0
0.1
0.2
0.5
1
2
5
10
20
I_C(mA)
100
V_{CE} =1V
T_j =25°C
max
typ
min
7205305-26.25 ij

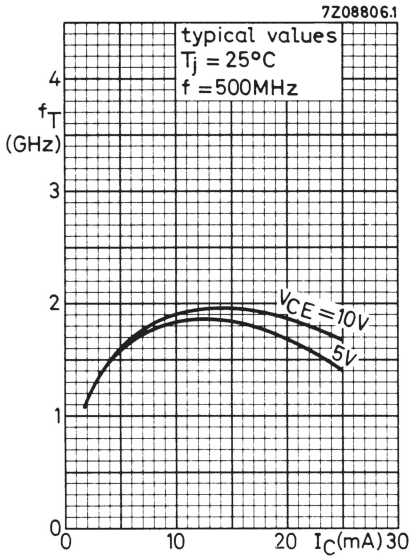

10^2
I_C
(mA)
10
1
10^{-1}
10^{-3}
10^{-2}
10^{-1}
1
10
I_B (mA)
10^2
Base current versus collector current
V_{CE} =1V
T_j =25°C
min
typ
max
7205304-26.25 ij

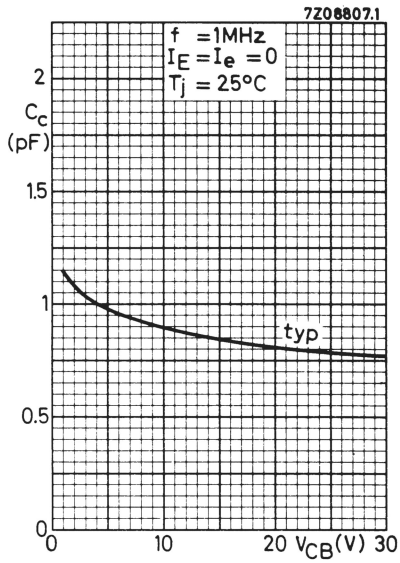

Typical values
V_{CE} =5V
T_j =25°C
ωC_{ie} ($m\Omega^{-1}$)
g_{ie} ($m\Omega^{-1}$)
I_C =2mA
4mA
8mA
14mA
2V
10V
200MHz
500MHz
800MHz
0
5
10
15
20
25
7Z05297.2.25.25.ij

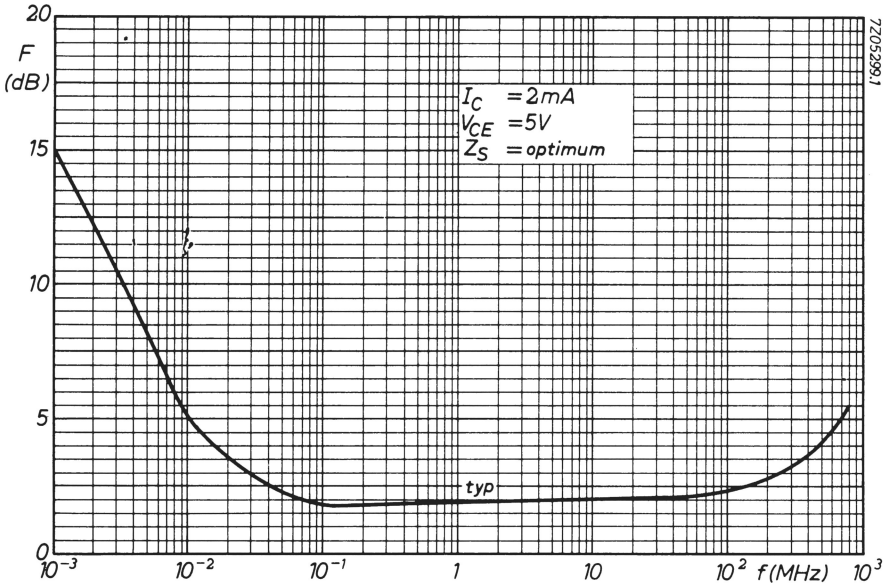

$|y_{re}|$ ($m\Omega^{-1}$)
φ_{re}
Typical values
T_j =25°C
200MHz
500MHz
800MHz
180°
195°
210°
225°
240°
255°
270°
285°
300°
315°
330°
345°
360°
10V
5V
2V
V_{CE}
2mA
I_C =20mA
7Z05295

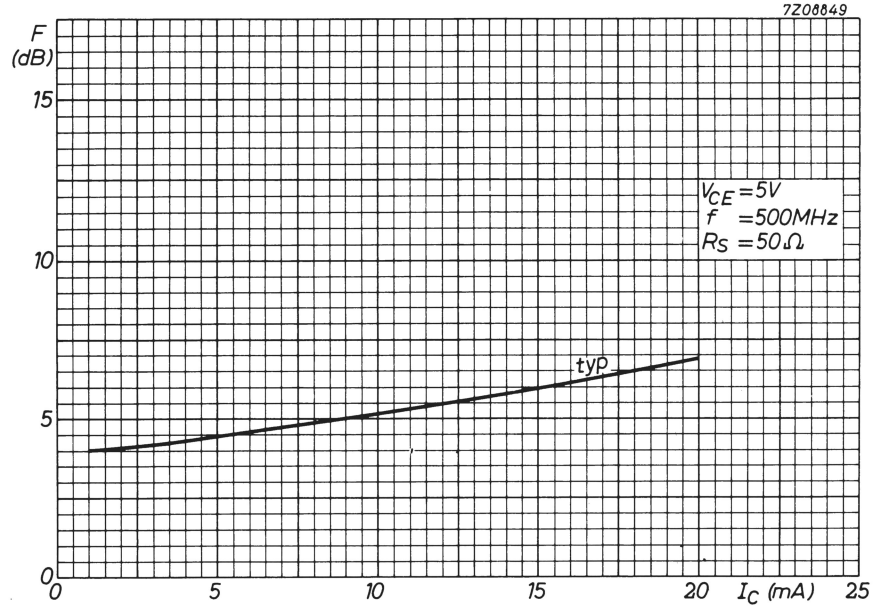

|yfe| (mΩ⁻¹)
200
150
100
50
0
50
100
150
200
180°
360°
φfe
Typical values
VCE = 5V
Tj = 25°C
800MHz
500MHz
200MHz
20mA
10mA
6mA
4mA
2mA
IC = 2mA
195°
345°
210°
330°
225°
315°
240°
300°
255°
285°
270°
7Z05308


ωCoe
(mΩ⁻¹)
Typical values
VCE = 5V
Tj = 25°C
f = 800MHz
500MHz
200MHz
2V
10V
IC = 2mA
10mA
15mA
20mA
goe (mΩ⁻¹)
0.01
0.02
0.05
0.1
0.2
0.5
1
2
10
0
5
10
15
20
7Z05296 - 26.25.ij


7Z08806.1
typical values
Tj = 25°C
f = 500MHz
fT (GHz)
4
3
2
1
0
VCE = 10V
5V
0
10
20
IC(mA) 30


7Z08807.1
f = 1MHz
IE = Ie = 0
Tj = 25°C
Cc (pF)
2
1.5
1
0.5
0
typ
0
10
20
VCB(V) 30


7Z05289.1
20
F
(dB)
15
10
5
0
I_C = 2mA
V_{CE} = 5V
Z_S = optimum
typ
10^{-3}
10^{-2}
10^{-1}
1
10
10^2
f(MHz)
10^3


7Z08849
F
(dB)
15
10
5
0
V_{CE} = 5V
f = 500MHz
R_S = 50Ω
typ
0
5
10
15
20
I_C (mA)
25

SILICON PLANAR EPITAXIAL TRANSISTOR

N-P-N transistor in TO-72 metal envelope with insulated electrodes and a shield lead connected to the case. The 2N918 is primarily intended for low power amplifiers and oscillators in the v.h.f. and u.h.f. ranges for industrial service.

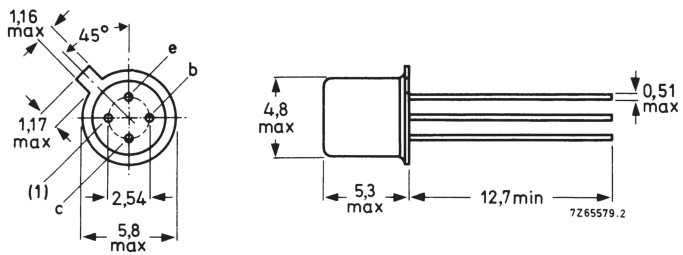
QUICK REFERENCE DATA

Collector-base voltage (open emitter)	V_{CBO}	max.	30 V
Collector-emitter voltage (open base)	V_{CEO}	max.	15 V
Collector current (d.c.)	I_C	max.	50 mA
Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200 mW
Junction temperature	T_j	max.	200 °C
Transition frequency I_C = 6 mA; V_{CE} = 10 V	f_T	>	900 MHz
Maximum unilateralized power gain I_C = 6 mA; V_{CE} = 12 V; f = 200 MHz	G_{UM}	typ.	36 dB
Noise figure at f = 60 MHz I_C = 1 mA; V_{CE} = 6 V; R_S = 400 Ω	F	<	6 dB

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-72.



(1) = shield lead (connected to case).

Accessories: 56246 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages

Collector-base voltage (open emitter)	V_{CBO}	max.	30	V
Collector-emitter voltage (open base) I_C = 3 mA	V_{CEO}	max.	15	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V

Currents

Collector current (d.c.)	I_C	max.	50	mA

Power dissipation

Total power dissipation up to T_{amb} = 25 °C	P_{tot}	max.	200	mW

Temperatures

Storage temperature	T_{stg}	-65 to +200		°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j\text{-}a}$	=	0.88	°C/mW
From junction to case	$R_{th\ j\text{-}c}$	=	0.58	°C/mW

CHARACTERISTICS $T_j = 25\ ^oC$ unless otherwise specified
All measurements taken with ungrounded shield lead

Collector cut-off current			
$I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	< 10	nA
$I_E = 0$; $V_{CB} = 15$ V; $T_j = 150\ ^oC$	I_{CBO}	< 1	μA
Saturation voltages			
$I_C = 10$ mA; $I_B = 1$ mA	V_{CEsat}	< 0.4	V
	V_{BEsat}	< 1	V
D.C. current gain			
$I_C = 3$ mA; $V_{CE} = 1$ V	h_{FE}	> 20	
Collector capacitance at f = 140 kHz			
$I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	< 1.7	pF
$I_E = I_e = 0$; $V_{CB} = 0$	C_c	< 3.0	pF
Emitter capacitance at f = 140 kHz			
$I_C = I_c = 0$; $V_{EB} = 0.5$ V	C_e	< 2.0	pF
Transition frequency			
$I_C = 6$ mA; $V_{CE} = 10$ V [1]	f_T	> 900	MHz
Noise figure at f = 60 MHz			
$I_C = 1$ mA; $V_{CE} = 6$ V; $R_S = 400\ \Omega$	F	< 6	dB
Oscillator power output at f = 500 MHz			
$-I_E = 8$ mA; $V_{CB} = 15$ V	P_o	> 30	mW
Maximum unilateralised power gain			
$G_{UM} = \frac{\lvert y_{fe}\rvert^2}{4 g_{ie} g_{oe}}$			
$I_C = 6$ mA; $V_{CE} = 12$ V; f = 200 MHz	G_{UM}	typ. 36	dB

[1]) JEDEC registration: $I_C = 4$ mA; $V_{CE} = 10$ V, $f_T > 600$ MHz.

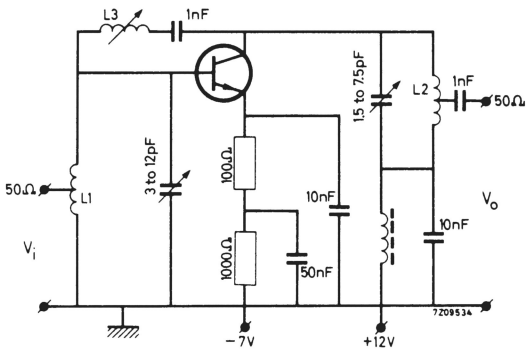
CHARACTERISTICS (continued) $T_j = 25\ ^oC$

Available power gain at f = 200 MHz

I_C = 6 mA G_p > 15 dB

Basic circuit for measuring the available neutralised power gain

Grounded shield lead



L1 = 3.5 turns tinned Cu wire, 1.3 mm
d = 8 mm; length = 11 mm

Tap at ≈ 2 turns from earth side

L2 = 8 turns tinned Cu wire, 1.3 mm
d = 3 mm; length = 22 mm

Tap at 1 turn from earth side

L3 = 0.4 to 0.65 μH

DEVICE DATA

CATV amplifier modules

type number	frequency range MHz	power gain (dB) at f = 50 MHz	application	page
BGY61	5 - 200	13,0 ± 0,5	reverse amplifiers	461
BGY65		18,5 ± 0,5		465
BGY67		22,5 ± 0,5		469
BGY67A		24,0 ± 0,5		473
BGY50	40 - 300	12,5 ± 0,4	preamplifier	429
BGY51			post amplifier	429
BGY52	40 - 300	16,4 ± 0,4	preamplifier	433
BGY53			post amplifier	433
BGY54	40 - 300	17,0 ± 0,4	preamplifier	437
BGY55			post amplifier	437
BGY56	40 - 300	22,0 ± 0,6	preamplifier	441
BGY57			post amplifier	441
BGY58	40 - 300	33,0 ± 1,0	line extender	445
BGY58A	40 - 300	34,0 ± 1,0	line extender	449
BGY59	40 - 300	38,5 ± 1,0	line extender	453
BGY60	40 - 300	33,5 ± 1,0	interstage amplifier (2 x 17 dB)	457
BGD102	40 - 450	18,5 ± 0,5	power doubler	421
BGD104		20,0 ± 0,5	amplifiers	421
BGD102E	40 - 450	18,5 ± 0,5	power doubler	425
BGD104E		20,0 ± 0,5	amplifiers	425
BGY70	40 - 450	12,5 ± 0,4	preamplifier	477
BGY71			post amplifier	477
BGY74	40 - 450	17,0 ± 0,4	preamplifier	481
BGY75			post amplifier	481
BGY78	40 - 450	34,0 ± 1,0	line extender	485
BGY84	40 - 450	17,0 ± 0,5	preamplifier	489
BGY85			post amplifier	489
BGY84A	40 - 450	18,4 ± 0,4	preamplifier	493
BGY85A			post amplifier	493

All modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

CATV POWER-DOUBLER AMPLIFIER MODULES

Power-doubler amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGD102: 18,5 dB gain;
BGD104: 20,0 dB gain.

Features:

- excellent linearity;
- high output level;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGD102	BGD104	
Frequency range	f		40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S=Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_P		18,5 ±0,5	20,0 ±0,5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L		0,5 to 2,5	0,5 to 2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽	±0,3	±0,3	dB
Return losses at input and output f = 40 MHz to 450 MHz	S_{11-22}	⩾	18	18	dB
2nd order distortion V_o = 46 dBmV	d_2	⩽	−73	−73	dB
Composite triple beat; 60 channels V_o = 46 dBmV	CTB	⩽	−65	−64	dB
Cross modulation V_o = 46 dBmV at 60 channels	X_{mod}	⩽	−67	−66	dB
Noise figure f = 40 MHz to 450 MHz	F	⩽	7	7	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = +24 V	I_{tot}	⩽	435	435	mA

MECHANICAL DATA

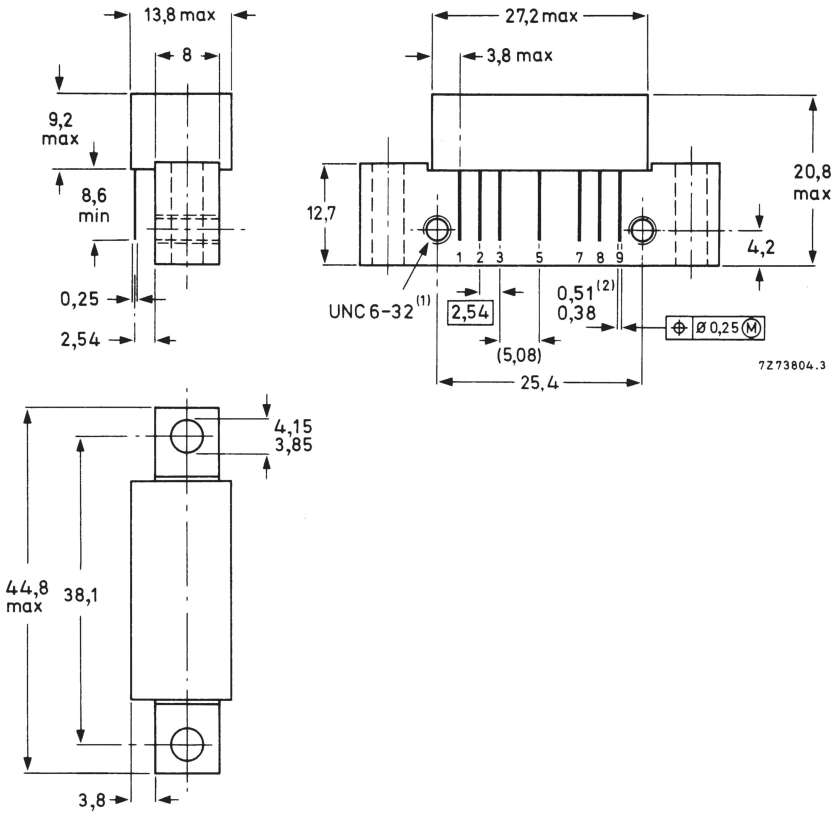
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories")
(2) Gold-plated leads.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max. 65	dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +100	°C

CHARACTERISTICS

Supply voltage V_B = +24 V; T_{mb} = 35 °C

			BGD102	BGD104	
Power gain at f = 50 MHz	G_P		18,5 ±0,5	20,0 ±0,5	dB
Power gain at f = 450 MHz	G_P		19,2–21,2	20,5–22,5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L		0,5 to 2,5	0,5 to 2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	≤	±0,3	±0,3	dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; f = 40 MHz to 450 MHz	S_{11-22}	≥	18	18	dB
2nd order distortion V_o = 46 dBmV; channel 2 V_o = 46 dBmV; channel H5 Measured at channel H14	d_2	≤	−73	−73	dB
Composite triple beat at 60 channels V_o = 46 dBmV; tested in channel H22	CTB	≤	−65	−64	dB
Cross modulation at 60 channels V_o = 46 dBmV; tested in channel 2	X_{mod}	≤	−67	−66	dB
Noise figure f = 40 MHz to 450 MHz	F	≤	7	7	dB
Total d.c. current consumption	I_{tot}	≤	435	435	mA

CATV POWER-DOUBLER AMPLIFIER MODULES

Power-doubler amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGD102E: 18,5 dB gain;
BGD104E: 20,0 dB gain.

Features:

- excellent linearity;
- high output level;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGD102E	BGD104E	
Frequency range	f		40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S=Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_P		18,5 ±0,5	20,0 ±0,5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L		0,5 to 2,5	0,5 to 2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽	±0,3	±0,3	dB
Return losses at input and output					
at f = 40 MHz	S_{11-22}	⩾	20	20	dB
at f = 450 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB					
f(p+q−r)= 438,25 MHz (DIN 45004B, par.6.3: 3-tone)	V_o	⩾	65,0	64,5	dBmV
2nd order distortion V_o = 46 dBmV	d_2	⩽	−73	−73	dB
Noise figure f = 40 MHz to 450 MHz	F	⩽	7	7	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = +24 V	I_{tot}	⩽	435	435	mA

MECHANICAL DATA

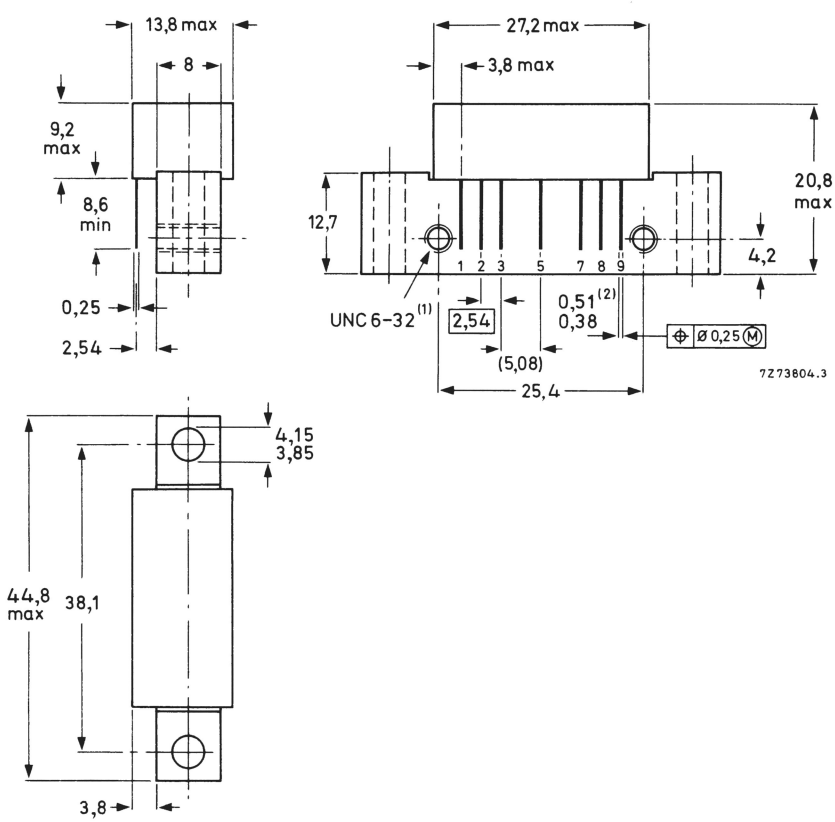
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Gold-plated leads.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max. 65	dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +100	°C

CHARACTERISTICS

Supply voltage V_B = +24 V; T_{mb} = 35 °C

			BGD102E	BGD104E	
Power gain at f = 50 MHz	G_P		18,5 ±0,5	20,0 ±0,5	dB
Power gain at f = 450 MHz	G_P		19,2–21,2	20,5–22,5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L		0,5 to 2,5	0,5 to 2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	≤	±0,3	±0,3	dB
Return losses at input and output at $Z_S = Z_L = 75\ \Omega$;					
f = 40 MHz to 80 MHz	S_{11-22}	≥	20	20	dB
f = 80 MHz to 160 MHz	S_{11-22}	≥	19	19	dB
f = 160 MHz to 450 MHz	S_{11-22}	≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B,6.3: 3-tone)					
$V_p = V_o$; f_p = 440,25 MHz					
$V_q = V_o$ −6 dB; f_q = 447,25 MHz					
$V_r = V_o$ −6 dB; f_r = 449,25 MHz					
Measured at $f_{(p+q-r)}$ = 438,25 MHz	V_o	≥	65,0	64,5	dBmV
2nd order distortion					
V_o = 46 dBmV; channel 2					
V_o = 46 dBmV; channel H5					
Measured at channel H14	d_2	≤	−73	−73	dB
Noise figure f = 40 MHz to 450 MHz	F	≤	7	7	dB
Total d.c. current consumption	I_{tot}	≤	435	435	mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

			BGY50	BGY51	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+0,2 to +0,8	+0,2 to +0,8	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	0,2	0,2	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	61	63,5	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	7	8	dB
D.C. supply voltage	$+V_B$	=	24	24	V *
Total d.c. current consumption at V_B = +24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to +90	−20 to +90	°C

MECHANICAL DATA

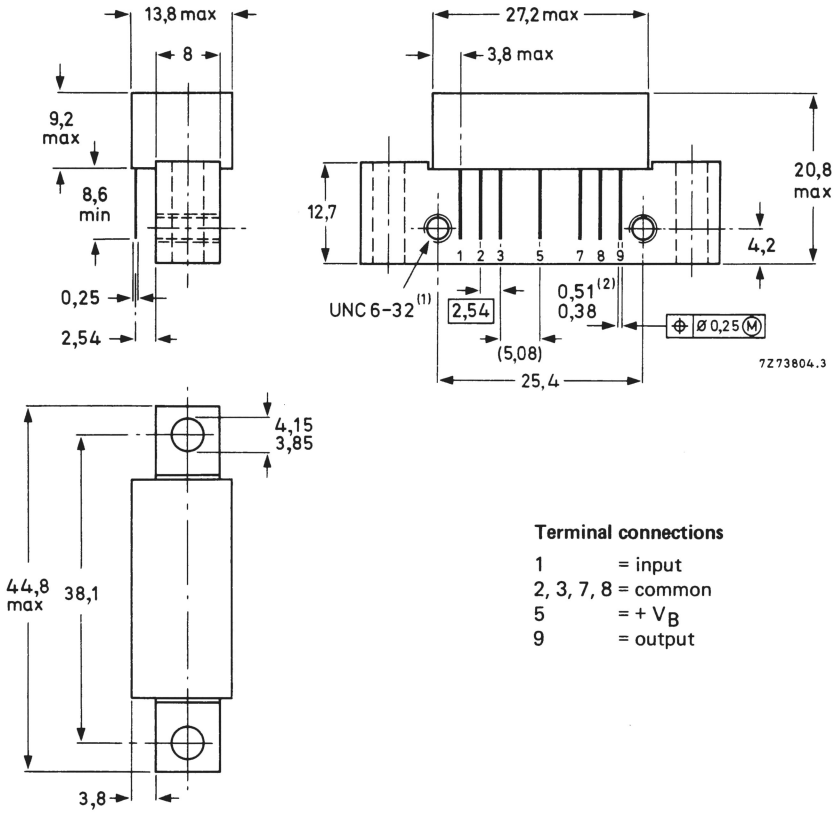
SOT-115 (see Fig. 1).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Tin-plated leads.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY50	BGY51	
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+0,2 to +0,8	+0,2 to +0,8	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	0,2	0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61	63,5	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	7	8	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

			BGY52	BGY53	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		16,4 ± 0,4	16,4 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	0,1	0,1	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	61	63,5	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	7	dB
D.C. supply voltage	$+V_B$	=	24	24	V *
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

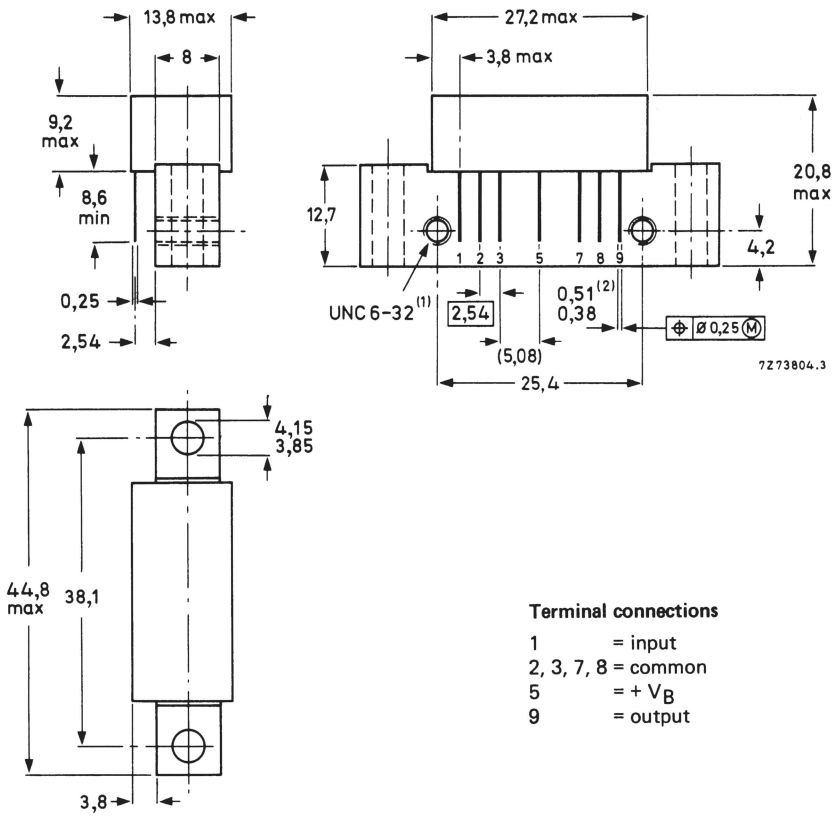
SOT-115 (see Fig. 1).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Gold-plated leads.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65	dBmV
Storage temperature	T_{stg}	−40 to +	100	°C
Operating mounting base temperature	T_{mb}	−20 to +	90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY52	BGY53	
Power gain at f = 50 MHz	G_p		16,4 ± 0,4	16,4 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	0,1	0,1	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61	63,5	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−68	−70	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	7	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 300 MHz.

BGY54: 17 dB input amplifier module;
BGY55: 17 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGY54	BGY55	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to 1,0	0 to 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,1	± 0,1	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	20	20	dB
Output voltage at d_{im} = –60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	61	63,5	dBmV
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	⩽	–71	–73	dB
Composite triple beat 32 channels V_o = 46 dBmV		⩽	–65	–67	dB
Output capability X_{mod} = –57 dB; 32 channels flat	V_o	⩾	47,5	50	dBmV
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	6,5	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		–20 to + 90	–20 to + 90	°C

MECHANICAL DATA

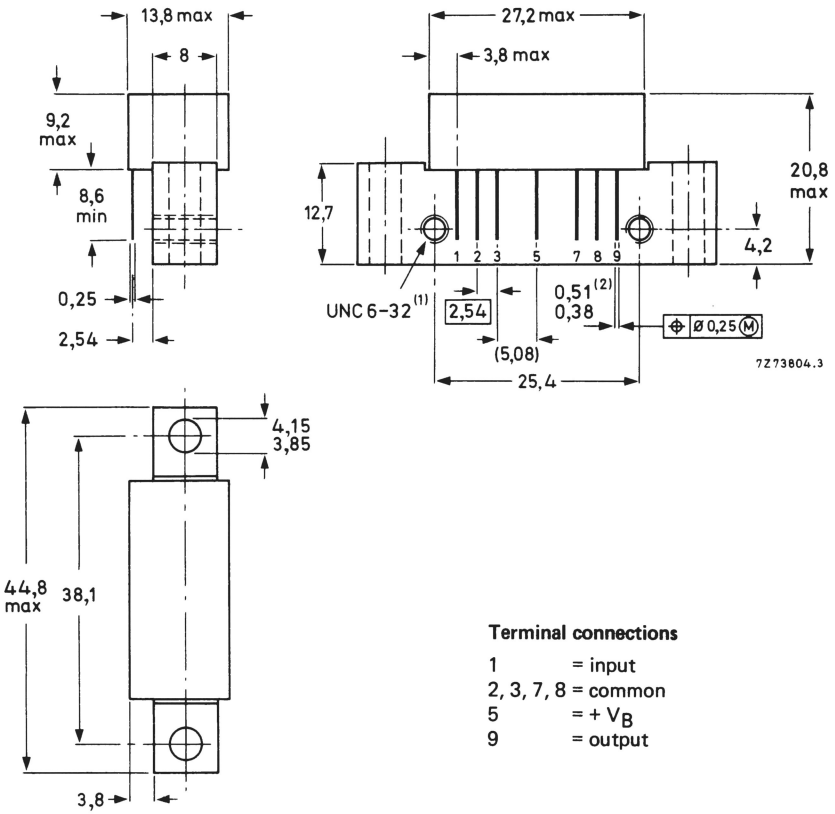
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Gold-plated leads.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY54	BGY55	
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to 1,0	0 to 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,1	± 0,1	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	20	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$−6 dB; f_q = 294,25 MHz $V_r = V_o$−6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61	63,5	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	⩽	−71	−73	dB
Composite triple beat 32 channels V_o = 46 dBmV; channel W		⩽	−65	−67	dB
Output capability on channel W X_{mod} = −57 dB; 32 channels flat	V_o	⩾	47,5	50	dBmV
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	6,5	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULES

Hybrid amplifier modules intended for CATV systems.

QUICK REFERENCE DATA

			BGY56	BGY57	
Frequency range	f		40 to 300	40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		22,0 ± 0,6	22,0 ± 0,6	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,2	± 0,2	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	20	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	61,5	64	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−64	−66	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	7	dB
D.C. supply voltage	$+V_B$	=	24	24	V *
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	−20 to + 90	°C

MECHANICAL DATA

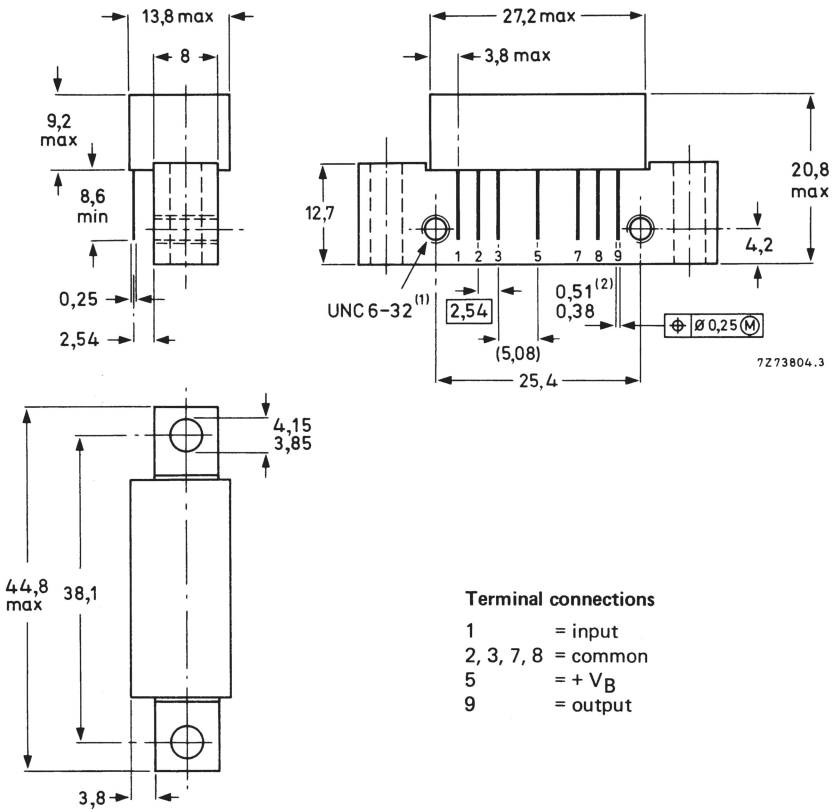
SOT-115 (see Fig. 1).

* The modules are able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max. 63	dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C

CHARACTERISTICS

			BGY56	BGY57	
Supply voltage V_B = + 24 V; T_{amb} = 25 °C					
Power gain at f = 50 MHz	G_p		22,0 ± 0,6	22,0 ± 0,6	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,0	0 to + 1,0	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,2	± 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾	20	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004 par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	61,5	64	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−64	−66	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	7	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Hybrid amplifier module intended for CATV systems.

QUICK REFERENCE DATA

Frequency range	f		40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	Ω
Power gain at f = 50 MHz	G_p		33,0 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5	dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	± 0,3	dB
Return losses at input and output f = 40 MHz to 300 MHz		≥	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	≥	64	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	≤	−68	dB
Noise figure f = 40 MHz to 300 MHz	F	≤	6	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	320	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	°C

MECHANICAL DATA

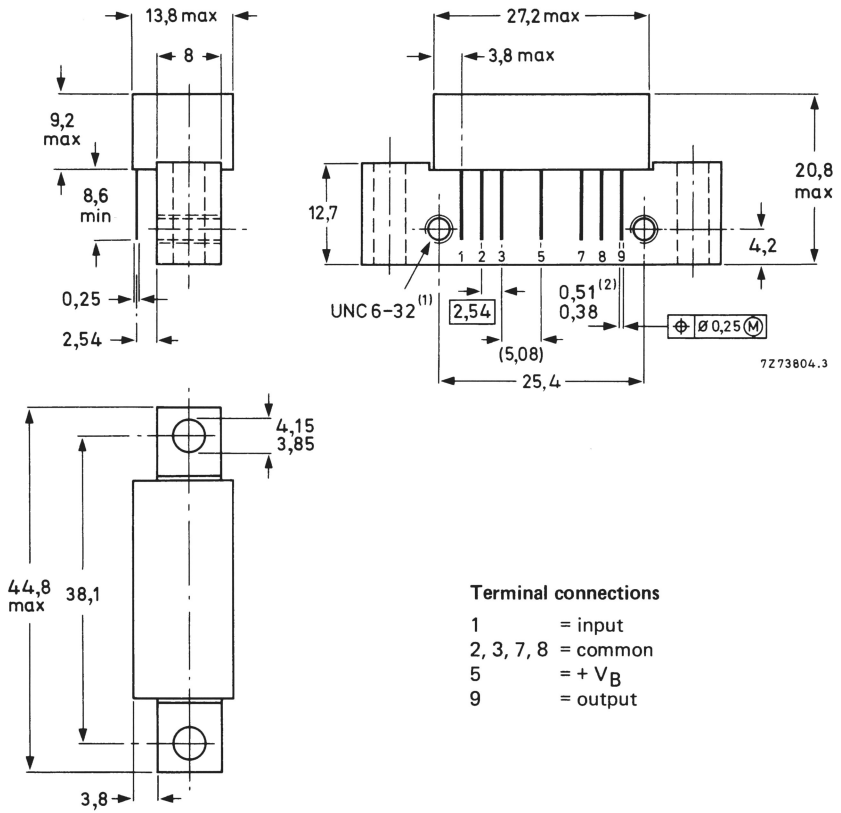
SOT-115 (see Fig. 1).

* The module is able to withstand incidental short peaks in the supply voltage up to a maximum of 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}		−40 to +100 °C
Operating mounting base temperature	T_{mb}		−20 to +90 °C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		33,0 ± 1,0 dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5 dB
Flatness of frequency response f = 40 MHz to 300 MHz		≤	± 0,3 dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		≥	20 dB
Output voltage at d_{im} = −60 dB (DIN 45004, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	64 dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−68 dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6 dB
Total d.c. current consumption	I_{tot}	typ. ⩽	320 mA 340 mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34 dB line extender in CATV systems operating at frequencies up to 330 MHz.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

Frequency range	f	40 to 330	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 50 MHz	G_p	34,0 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 330 MHz		0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 330 MHz		⩽ ± 0,3	dB
Return losses at input and output f = 40 MHz to 330 MHz		⩾ 20	dB
Output voltage at d_{im} = –60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾ 64	dBmV
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	⩽ –70	dB
Composite triple beat 32 channels V_o = 46 dBmV		⩽ –67	dB
Output capability X_{mod} = –57 dB; 32 channels flat	V_o	⩾ 50	dBmV
Noise figure f = 40 MHz to 330 MHz	F	⩽ 6	dB
D.C. supply voltage	$+V_B$	= 24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ. 320	mA
Operating mounting base temperature	T_{mb}	–20 to + 90	°C

MECHANICAL DATA

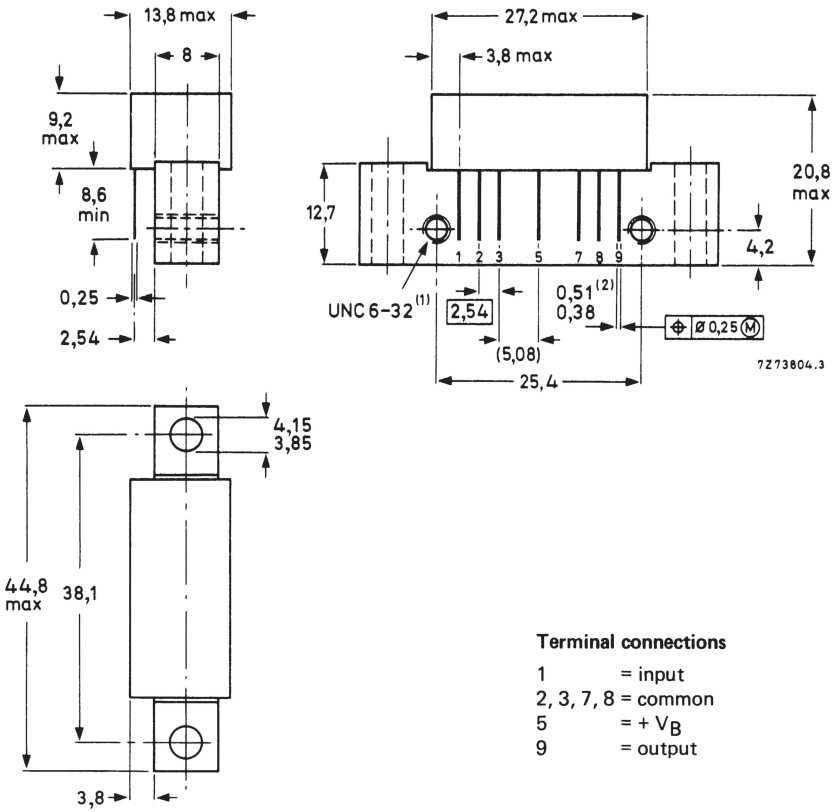
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p	34,0 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 330 MHz		0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 330 MHz	⩽	± 0,3	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 330 MHz	⩾	20	dB
Output voltage at d_{im} = −60 dB (DIN 45004, 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$−6 dB; f_q = 294,25 MHz $V_r = V_o$−6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o ⩾	64	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2 ⩽	−70	dB
Composite triple beat 32 channels V_o = 46 dBmV; channel W	⩽	−67	dB
Composite triple beat 40 channels V_o = 46 dBmV; channel W	⩽	−63	dB
Output capability on channel W X_{mod} = −57 dB; 32 channels flat	V_o ⩾	50	dBmV
X_{mod} = −57 dB; 40 channels flat	V_o ⩾	49,5	dBmV
Noise figure f = 40 MHz to 330 MHz	F ⩽	6	dB
Total d.c. current consumption	I_{tot} typ. ⩽	320 mA 340 mA	

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Hybrid amplifier module intended for CATV systems up to 300 MHz.

QUICK REFERENCE DATA

Frequency range	f		40 to 300	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	Ω
Power gain at f = 50 MHz	G_p		38,5 ±1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz			0 to + 1,5	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,3	dB
Return losses at input and output f = 40 MHz to 300 MHz		⩾	18	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6,3: 3-tone)	V_o	⩾	64	dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−68	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption at V_B = +24 V	I_{tot}	typ.	320	mA
Operating mounting base temperature	T_{mb}		−20 to +90	°C

MECHANICAL DATA

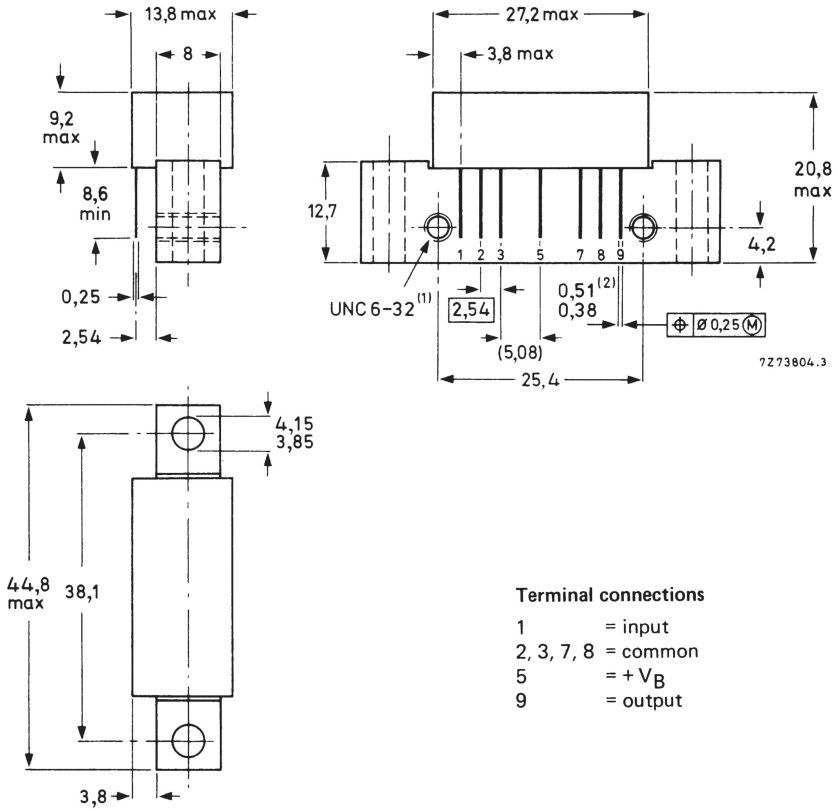
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads tin-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	53 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p	38,5 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz		0 to + 1,5	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽ ± 0,3	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz		⩾ 18	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾ 64	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽ −68	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽ 6	dB
Total d.c. current consumption	I_{tot}	typ. 320 ⩽ 340	mA mA

HYBRID V.H.F. PUSH-PULL AMPLIFIER MODULE

Interstage hybrid amplifier module intended for CATV systems up to 300 MHz. The inputs and outputs of the stages have been terminated separately.

QUICK REFERENCE DATA for total amplifier unless otherwise specified

Frequency range	f		40 to 300		MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75		Ω
Power gain at f = 50 MHz	G_p		33,5 ± 1,0		dB
Slope cable equivalent f = 40 MHz to 300 MHz			+0,5 to +1,5		dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	±0,3		dB
			pre-stage	**final stage**	
Return losses at input and output f = 40 MHz to 300 MHz	s_{11}	⩾	20	18	dB
	s_{22}	⩾	18	20	dB
Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone)	V_o	⩾	64		dBmV
2nd harmonic distortion at V_o = 50 dBmV	d_2	⩽	−66		dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6		dB
D.C. supply voltage	$+V_B$	=	24		V*
Total d.c. current consumption at V_B = +24 V	I_{tot}	typ.	320		mA
Operating mounting base temperature	T_{mb}		−20 to +90		°C

MECHANICAL DATA

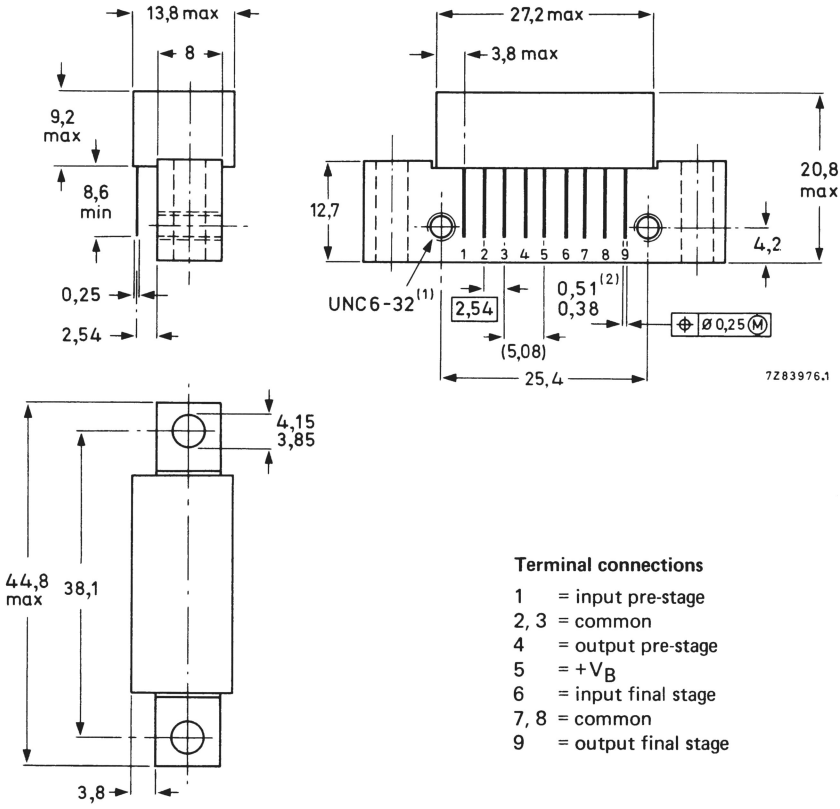
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input pre-stage
2, 3	= common
4	= output pre-stage
5	= $+V_B$
6	= input final stage
7, 8	= common
9	= output final stage

(1) Will become 6-32UNC-2B in the course of 1983. Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Leads tin-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage total amplifier	V_i	max. 55	dB/mV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS for total amplifier unless otherwise specified.

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p		33,5 ± 1,0	dB
Slope cable equivalent f = 40 MHz to 300 MHz			+ 0,5 to + 1,5	dB
Flatness of frequency response f = 40 MHz to 300 MHz		⩽	± 0,3	dB

			pre-stage	final stage	
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 300 MHz	s_{11}	⩾	20	18	dB
	s_{22}	⩾	18	20	dB

Output voltage at d_{im} = −60 dB (DIN45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	64	dBmV
2nd harmonic distortion $V_p = V_o$ = 50 dBmV; f_p = 66 MHz $V_q = V_o$ = 50 dBmV; f_q = 144 MHz Measured at $f_{(p+q)}$ = 210 MHz	d_2	⩽	−66	dB
Noise figure f = 40 MHz to 300 MHz	F	⩽	6	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	320 340	mA mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. The device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 10 MHz	G_p	13,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ ± 0,2	dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB; measured at 33,25 MHz (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾ 67	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	⩽ −72	dB
Composite triple beat; 22 channels V_o = 50 dBmV	CTB	⩽ −68	dB
Cross modulation at 22 channels V_o = 50 dBmV	X_{mod}	⩽ −61	dB
Noise figure f = 200 MHz	F	⩽ 7	dB
D.C. supply voltage	$+V_B$	= 24	V*
Total d.c. current consumption V_B = + 24 V	I_{tot}	typ. 200	mA
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

MECHANICAL DATA

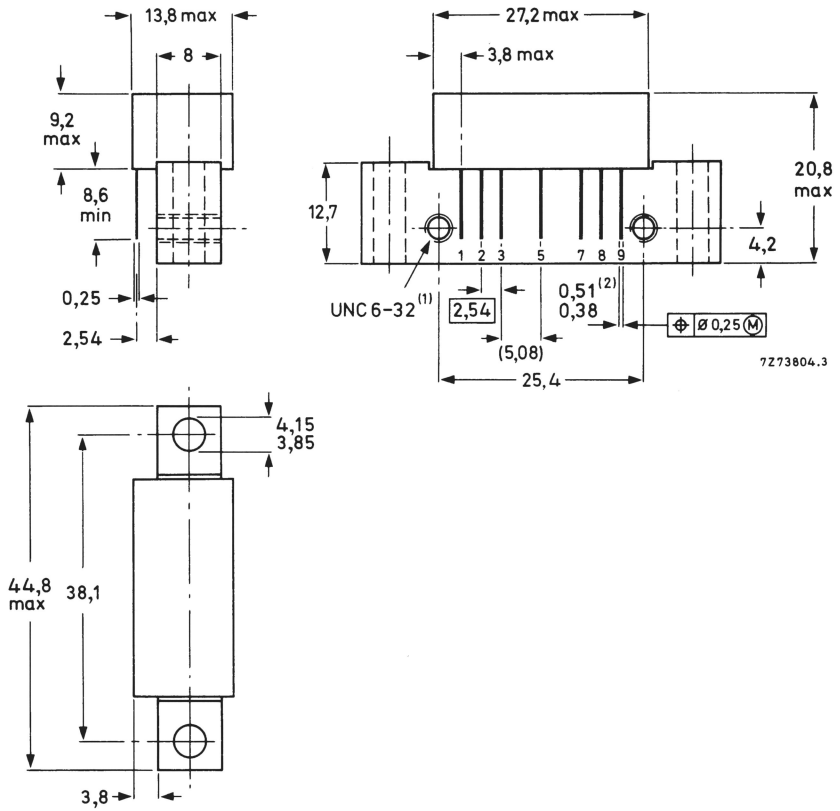
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transient up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories").

(2) Leads gold-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS at T_{mb} = 30 °C unless otherwise specified

Supply voltage V_B = + 24 V

Power gain at f = 10 MHz	G_p	13,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ ± 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 35,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ − 6 dB; f_r = 44,25 MHz Measured at $f_{(p+q-r)}$ = 33,25 MHz	V_o	⩾ 67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	⩾ 64	dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 90 MHz V_o = 50 dBmV; f_q = 100 MHz Measured at $f_{(p+q)}$ = 190 MHz	d_2	⩽ −72	dB
Composite triple beat on 22 channels V_o = 50 dBmV; measured in channel 7	CTB	⩽ −68	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	⩽ −61	dB
Noise figure f = 200 MHz	F	< 7,0	dB
Total d.c. current consumption	I_{tot}	typ. 200 ⩽ 230	mA mA

CATV REVERSE AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. This device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 10 MHz	G_p	18,5 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ ± 0,2	dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB; measured at 33,25 MHz (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾ 67	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	⩽ −72	dB
Composite triple beat; 22 channels V_o = 50 dBmV	CTB	⩽ −68	dB
Cross modulation at 22 channels V_o = 50 dBmV	X_{mod}	⩽ −61	dB
Noise figure f = 200 MHz	F	⩽ 5,5	dB
D.C. supply voltage	$+V_B$	= 24	V*
Total d.c. current consumption V_B = + 24 V	I_{tot}	typ. 200	mA
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

MECHANICAL DATA

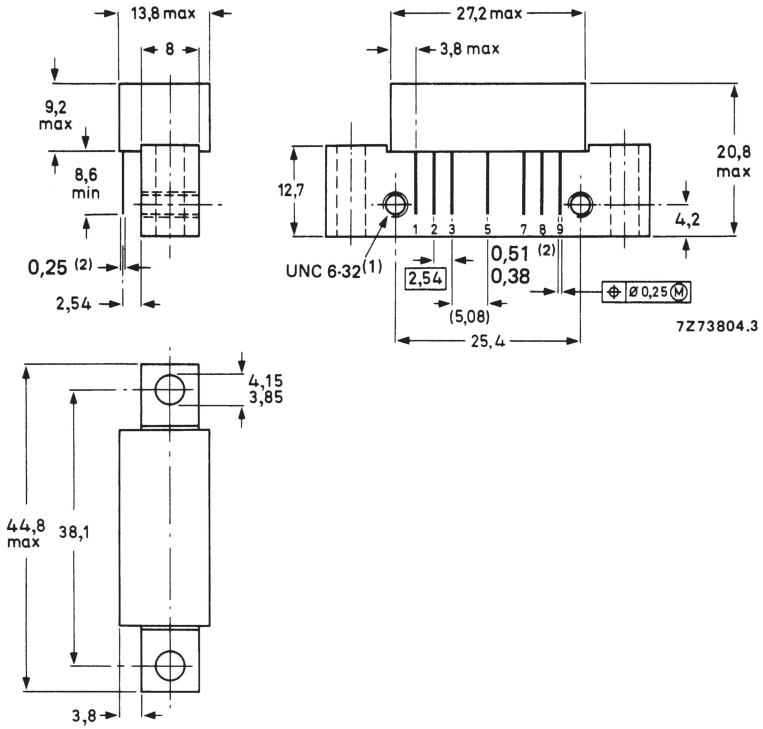
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads gold-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

CHARACTERISTICS

Supply voltage V_B = + 24 V at T_{mb} = 30 °C unless otherwise specified

Power gain at f = 10 MHz	G_p	18,5 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B; par. 6.3: 3-tone) $V_p = V_o$; f_p = 33,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ −6 dB; f_r = 44,25 MHz Measured at $f_{(p+q)}$ = 33,25 MHz	V_o	⩾ 67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B; par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	⩾ 64	dBmV
2nd-order distorion V_o = 50 dBmV; f_p = 90 MHz V_o = 50 dBmV; f_q = 100 MHz Measured at $f_{(p+q)}$ = 190 MHz	d_2	⩽ −72	dB
Composite triple beat at 22 channels V_o = 50 dBmV; measured in channel 7	CTB	⩽ −68	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	⩽ −61	dB
Noise figure f = 200 MHz	F	⩽ 5,5	dB
Total d.c. current consumption	I_{tot}	typ. 200 ⩽ 230	mA mA

CATV REVERSE AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. The device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f		5 to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 10 MHz	G_p		22,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L		−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽	± 0,2	dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	⩾	20	dB
Output voltage at d_{im} = −60 dB; measured at 33,25 MHz (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾	67	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	⩽	−67	dB
Composite triple beat; 22 channels V_o = 50 dBmV	CTB	⩽	−67	dB
Cross modulation at 22 channels V_o = 50 dBmV	X_{mod}	⩽	−60	dB
Noise figure f = 200 MHz	F	⩽	5,5	dB
D.C. supply voltage	$+ V_B$	=	24	V*
Total d.c. current consumption V_B = + 24 V	I_{tot}	typ.	200	mA
Operating mounting base temperature	T_{mb}		−20 to + 90	°C

MECHANICAL DATA

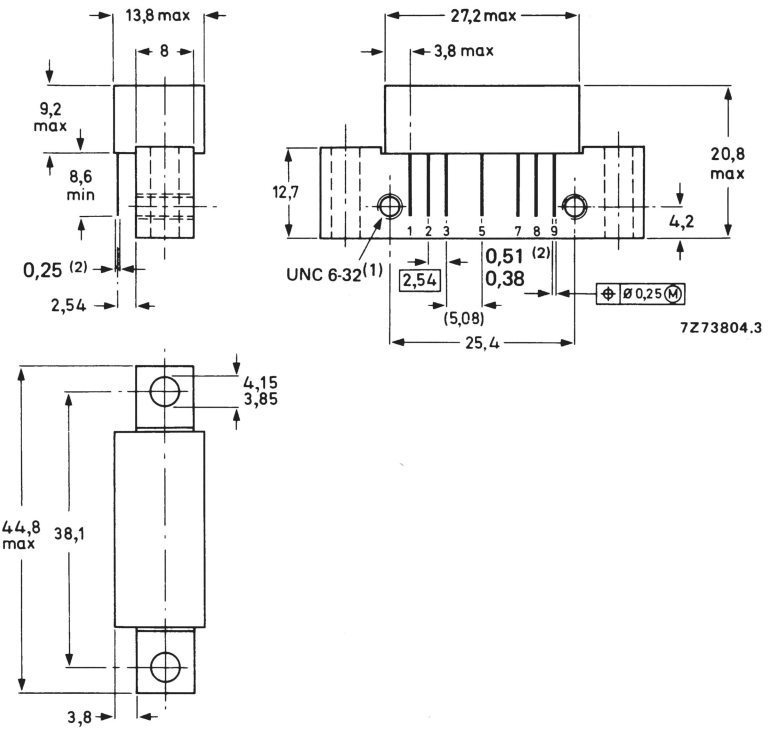
Sot-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories ").
(2) Leads gold-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C*

CHARACTERISTICS at T_{mb} = 30 °C unless otherwise specified

Supply voltage V_B = + 24 V

Power gain at f = 10 MHz	G_p	22,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ ± 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 33,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ −6 dB; f_r = 44,25 MHz Measured at $f_{(p+q-r)}$ = 33,25 MHz	V_o	⩾ 67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	⩾ 64	dBmV
2nd-order distortion V_o = 50 dBmV; f_p = 90 MHz V_o = 50 dBmV; f_q = 100 MHz Measured at $f_{(p+q)}$ = 190 MHz	d_2	⩽ −67	dB
Composite triple beat at 22 channels V_o = 50 dBmV; measured on channel 7	CTB	⩽ −67	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	⩽ −60	dB
Noise figure f = 200 MHz	F	⩽ 5,5	dB
Total d.c. current consumption	I_{tot}	typ. 200 ⩽ 230	mA mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use in CATV systems and operating at frequencies from 5 MHz to 200 MHz. This device is intended as a reverse amplifier for use in two-way systems.

QUICK REFERENCE DATA

Frequency range	f	5 to 200	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	Ω
Power gain at f = 10 MHz	G_p	24,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ +0,2	dB
Return losses at input and output f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB; measured at 33,25 MHz (DIN 45004B, par. 6,3: 3-tone)	V_o	⩾ 67	dBmV
2nd-order distortion V_o = 50 dBmV	d_2	⩽ −67	dB
Composite triple beat; 22 channels V_o = 50 dBmV	CTB	⩽ −67	dB
Cross modulation at 22 channels V_o = 50 dBmV	X_{mod}	⩽ −59	dB
Noise figure f = 200 MHz	F	⩽ 5,5	dB
D.C. supply voltage	$+V_B$	= 24	V*
Total d.c. current consumption V_B = + 24 V	I_{tot}	typ. 200	mA
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

MECHANICAL DATA

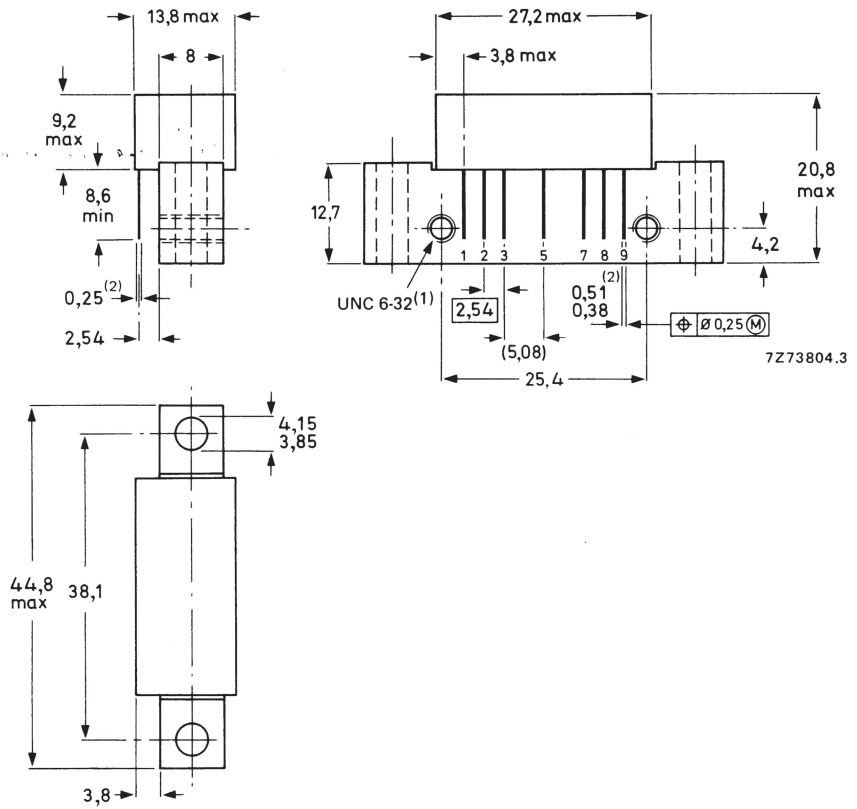
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads availavle in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	63 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS at T_{mb} = 30 °C unless otherwise specified

Supply voltage V_B = +24 V

Power gain at f = 10 MHz	G_p	24,0 ± 0,5	dB
Slope cable equivalent f = 5 MHz to 200 MHz	S_L	−0,2 to + 0,5	dB
Flatness of frequency response f = 5 MHz to 200 MHz	F_L	⩽ ± 0,2	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 5 MHz to 200 MHz	S_{11-22}	⩾ 20	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6,3: 3-tone) $V_p = V_o$; f_p = 35,25 MHz $V_q = V_o$ −6 dB; f_q = 42,25 MHz $V_r = V_o$ −6 dB; f_r = 44,25 MHz Measured at $f_{(p+q-r)}$ = 33,25 MHz	V_o	⩾ 67	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6,3: 3-tone) $V_p = V_o$; f_p = 187,25 MHz $V_q = V_o$ −6 dB; f_q = 194,25 MHz $V_r = V_o$ −6 dB; f_r = 196,25 MHz Measured at $f_{(p+q-r)}$ = 185,25 MHz	V_o	⩾ 64	dBmV
2nd order distortion V_o = 50 dBmV; f_p = 90 MHz V_o = 50 dBmV; f_q = 100 MHz Measured at $f_{(p+q)}$ = 190 MHz	d_2	⩽ −67	dB
Composite triple beat at 22 channels V_o = 50 dBmV; measured on channel 7	CTB	⩽ −67	dB
Cross modulation at 22 channels V_o = 50 dBmV; measured in channel 2	X_{mod}	⩽ −59	dB
Noise figure f = 200 MHz	F	⩽ 5,5	dB
Total d.c. current consumption	I_{tot}	typ. 200 ⩽ 230	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY70: 12,5 dB input amplifier module;
BGY71: 12,5 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGY70	BGY71	
Frequency range	f		40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 2	0,5 to 2	dB
Flatness of frequency response f = 40 MHz to 450 MHz		⩽	± 0,2	± 0,2	dB
Return losses at input and output f = 40 MHz to 450 MHz		⩾	18	18	dB
Output voltage at d_{im} = –60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾	62,5	65	dBmV
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	⩽	–71	–73	dB
Composite triple beat 52 channels V_o = 46 dBmV		⩽	–55	–59	dB
Output capability X_{mod} = –57 dB; 52 channels flat	V_o	⩾	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽	7,5	8,5	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	160	200	mA
Operating mounting base temperature	T_{mb}		–20 to + 90	–20 to + 90	°C

MECHANICAL DATA

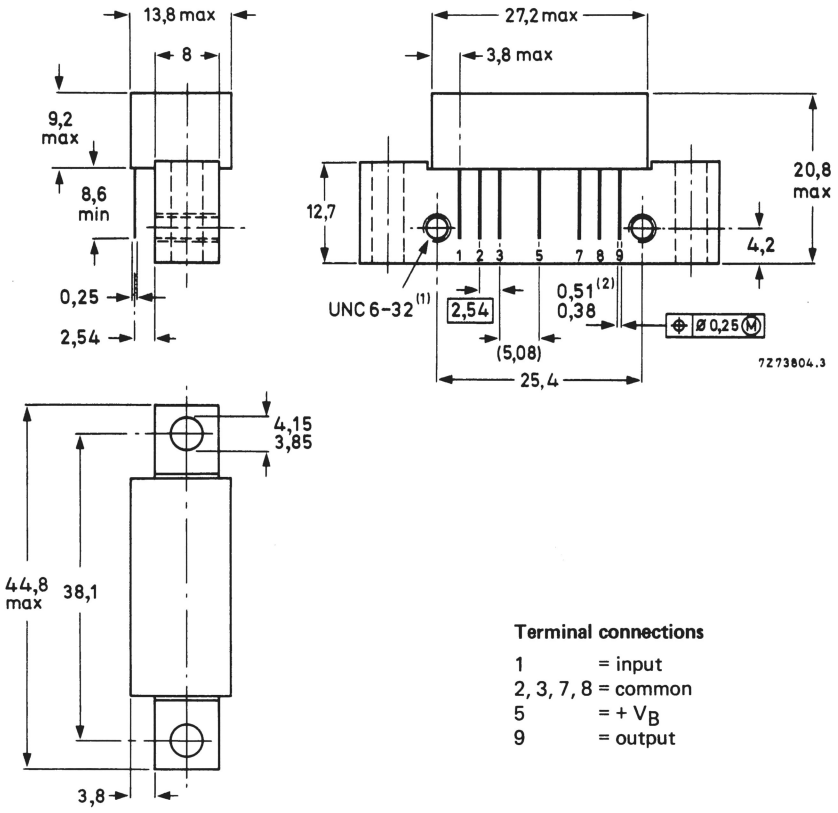
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads available in gold-plated and tin-plated execution.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	67 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY70	BGY71	
Power gain at f = 50 MHz	G_p		12,5 ± 0,4	12,5 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 2	0,5 to 2	dB
Flatness of frequency response f = 40 MHz to 450 MHz		⩽	± 0,2	± 0,2	dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; f = 40 MHz to 450 MHz		⩾	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 387,25 MHz $V_q = V_o$−6 dB; f_q = 394,25 MHz $V_r = V_o$−6 dB; f_r = 396,25 MHz Measured at $f_{(p+q-r)}$ = 385,25 MHz	V_o	⩾	61	63,5	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	62,5	65	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	⩽	−71	−73	dB
V_o = 50 dBmV; channel G V_o = 50 dBmV; channel N Measured at channel H 14	d_2	typ.	−68	−70	dB
Composite triple beat 52 channels V_o = 46 dBmV; channel H 14		⩽	−55	−59	dB
Output capability on channel H 14 X_{mod} = −57 dB; 52 channels flat	V_o	⩾	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽	7,5	8,5	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	160 180	200 220	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY74: 17 dB input amplifier module;
BGY75: 17 dB output amplifier module.

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

			BGY74	BGY75	
Frequency range	f		40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S = Z_L$	=	75	75	Ω
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 1,5	0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz		⩽	± 0,1	± 0,1	dB
Return losses at input and output f = 40 MHz to 450 MHz		⩾	18	18	dB
Output voltage at d_{im} = –60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾	62,5	65	dBmV
2nd order distortion at channel R V_o = 50 dBmV on channel 2 and 13	d_2	⩽	–71	–73	dB
Composite triple beat 52 channels V_o = 46 dBmV		⩽	–56	–60	dB
Output capability X_{mod} = –57 dB; 52 channels flat	V_o	⩾	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽	7	7,5	dB
D.C. supply voltage	$+V_B$	=	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ.	180	200	mA
Operating mounting base temperature	T_{mb}		–20 to + 90	–20 to + 90	°C

MECHANICAL DATA

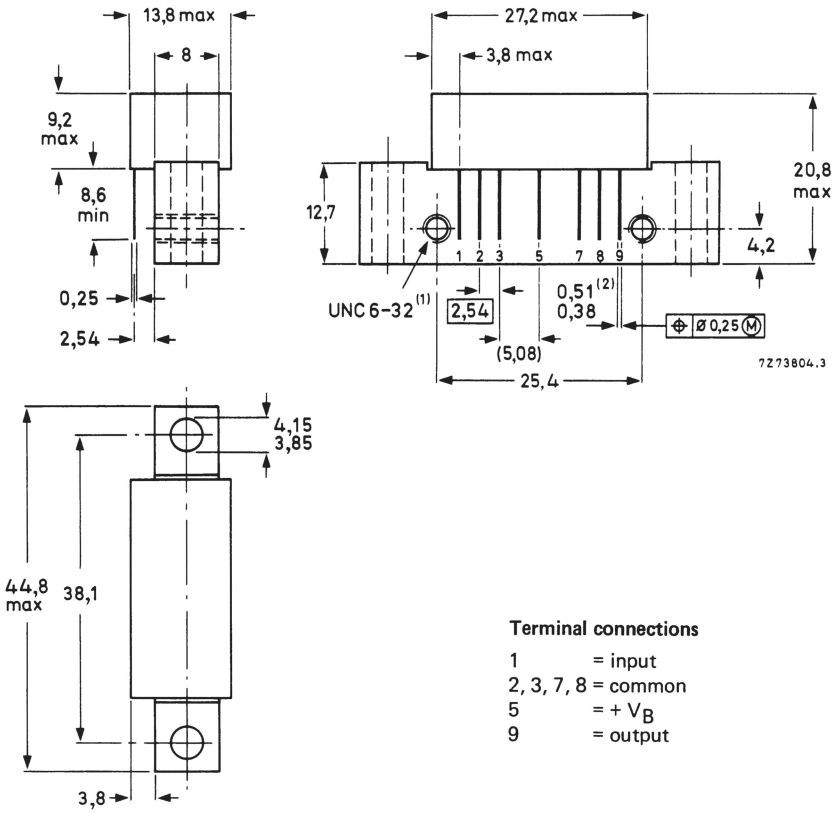
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads gold-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 90	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{amb} = 25 °C

			BGY74	BGY75	
Power gain at f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz			0,5 to 1,5	0,5 to 1,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz		≤	± 0,1	± 0,1	dB
Return losses at input and output $Z_S = Z_L$ = 75 Ω; f = 40 MHz to 450 MHz		⩽	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 387,25 MHz $V_q = V_o$−6 dB; f_q = 394,25 MHz $V_r = V_o$−6 dB; f_r = 396,25 MHz Measured at $f_{(p+q-r)}$ = 385,25 MHz	V_o	⩾	61	63,5	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o$ −6 dB; f_q = 294,25 MHz $V_r = V_o$ −6 dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾	62,5	65	dBmV
2nd order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	⩽	−71	−73	dB
V_o = 50 dBmV; channel G V_o = 50 dBmV; channel N Measured at channel H 14	d_2	typ.	−68	−70	dB
Composite triple beat 52 channels V_o = 46 dBmV; channel H 14		⩽	−56	−60	dB
Output capability on channel H 14 X_{mod} = −57 dB; 52 channels flat	V_o	⩾	46,5	49,5	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽	7	7,5	dB
Total d.c. current consumption	I_{tot}	typ. ⩽	180 200	200 220	mA mA

CATV AMPLIFIER MODULE

Hybrid amplifier module for use as 34 dB line extender in CATV systems operating at frequencies up to 450 MHz.

Features:

- excellent linearity;
- extremely low noise;
- optimum reliability ensured by TiPtAu metallized crystals, silicon nitride glass barrier and rugged construction.

QUICK REFERENCE DATA

Frequency range	f	40 to	450	MHz
Source impedance and load impedance	$Z_S = Z_L$		75	Ω
Power gain at f = 50 MHz	G_p	34,0 ±	1,0	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L	0,5 to	2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽	± 0,3	dB
Return losses at input and output f = 40 MHz to 450 MHz	S_{11-22}	⩾	18	dB
Output voltage at d_{im} = –60 dB (DIN 45004, par. 6.3: 3-tone)	V_o	⩾	63,5	dBmV
2nd-order distortion at channel R V_o = 50 dBmV on channels 2 and 13	d_2	⩽	–70	dB
Composite triple beat; 52 channels V_o = 46 dBmV	CTB	⩽	–59	dB
Output capability Xmod = –57 dB; 52 channels flat	V_o	⩾	47	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽	6	dB
D.C. supply voltage	$+V_B$	=	24	V*
Total d.c. current consumption V_B = +24 V	I_{tot}	typ.	320	mA
Operating mounting base temperature	T_{mb}	–20 to	+90	°C

MECHANICAL DATA

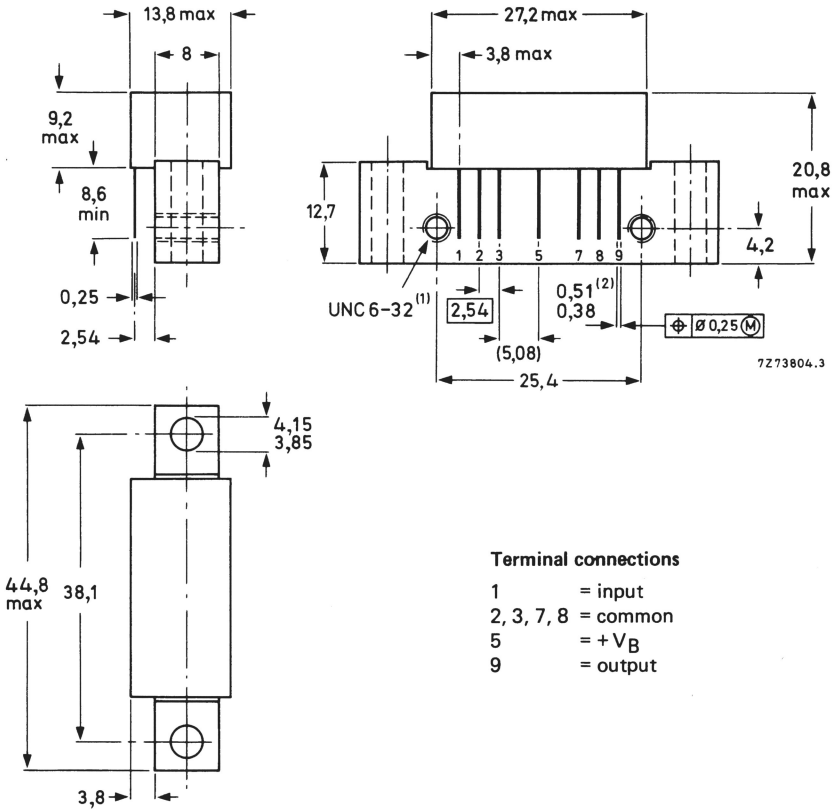
SOT-115 (see Fig. 1).

* The module normally operates at V_B = 24 V, but is able to withstand incidental supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32UNC-2A available upon request (see "Accessories").
(2) Leads gold-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	55 dBmV
Storage temperature	T_{stg}	−40 to +100	°C
Operating mounting base temperature	T_{mb}	−20 to +90	°C

CHARACTERISTICS

Supply voltage V_B = +24 V; T_{amb} = 25 °C

Power gain at f = 50 MHz	G_p	34,0	±	1,0	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L	0,5	to	2,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽	±	0,3	dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$; f = 40 MHz to 450 MHz	S_{11-22}	⩾		18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 387,25 MHz $V_q = V_o - 6$ dB; f_q = 394,25 MHz $V_r = V_o - 6$ dB; f_r = 396,25 MHz Measured at $f_{(p+q-r)}$ = 385,25 MHz	V_o	⩾		62	dBmV
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone) $V_p = V_o$; f_p = 287,25 MHz $V_q = V_o - 6$ dB; f_q = 294,25 MHz $V_r = V_o - 6$ dB; f_r = 296,25 MHz Measured at $f_{(p+q-r)}$ = 285,25 MHz	V_o	⩾		63,5	dBmV
2nd-order distortion V_o = 50 dBmV; channel 2 V_o = 50 dBmV; channel 13 Measured at channel R	d_2	⩽		−70	dB
V_o = 50 dBmV; channel G V_o = 50 dBmV; channel N Measured at channel H14	d_2	typ.		−67	dB
Composite triple beat 52 channels V_o = 46 dBmV; channel H14	CTB	⩽		−59	dB
Output capability on channel H14 Xmod = −57 dB; 52 channels flat	V_o	⩾		47	dBmV
Noise figure f = 40 MHz to 450 MHz	F	⩽		6	dB
Total d.c. current consumption	I_{tot}	typ. ⩽		320 340	mA mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY84: 17,0 dB input amplifier module
BGY85: 17,0 dB output amplifier module

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY84	BGY85	
Frequency range	f	40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	75	Ω
Power gain at f = 50 MHz	G_p	17,0 ± 0,5	17,0 ± 0,5	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L	0,5 to 1,5	0,5 to 1,5	dB
Return losses at input and output				
f = 40 MHz	S_{11-22}	⩾ 20	20	dB
f = 450 MHz		⩾ 18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾ 60	62,5	dBmV
2nd order distortion V_o = 46 dBmV	d_2	⩽ −70	−70	dB
Composite triple beat 60 channels V_o = 46 dBmV	CTB	⩽ −55	−58	dB
Cross modulation distortion V_o = 46 dBmV; 60 channels	X_{mod}	⩽ −57	−60	dB
Noise figure f = 40 MHz to 450 MHz	F	⩽ 6,5	7,0	dB
D.C. supply voltage	$+V_B$	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ. 180	220	mA

MECHANICAL DATA

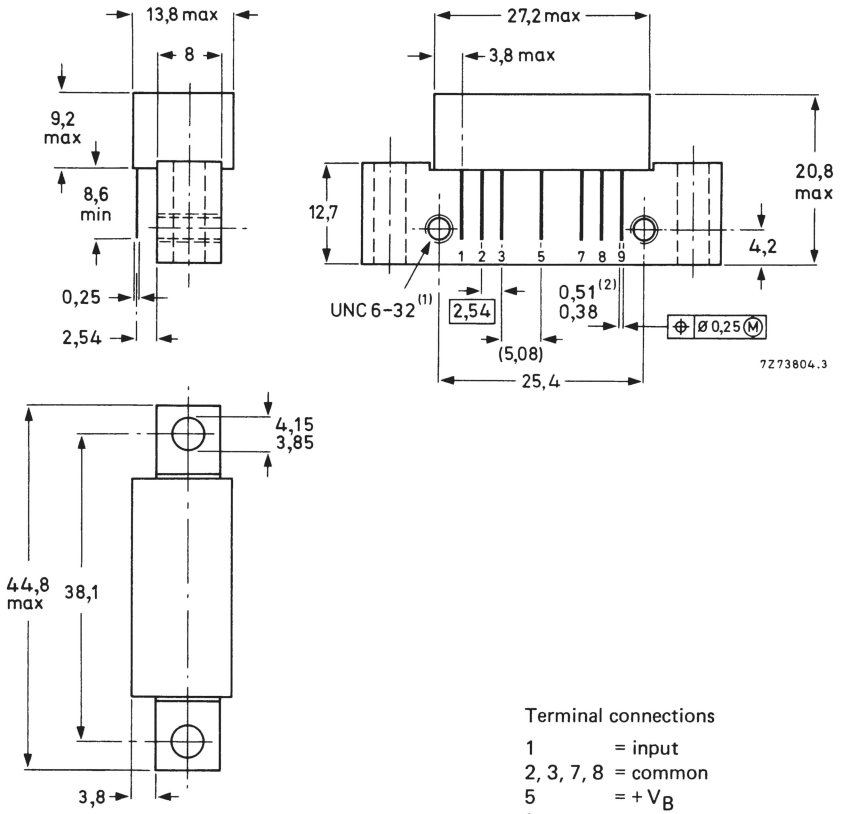
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= $+V_B$
9	= output

(1) Screw 6-32UNC-2A available on request (see "Accessories").
(2) Gold plated leads.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 100	°C

CHARACTERISTICS

Supply voltage V_B = + 24 V; T_{mb} = 30 °C

			BGY84	BGY85	
Power gain					
f = 50 MHz	G_p		17,0 ± 0,4	17,0 ± 0,4	dB
f = 450 MHz			17,3 to 18,8	17,3 to 18,8	dB
Slope cable equivalent					
f = 40 MHz to 450 MHz	S_L		+ 0,5 to + 1,5	+ 0,5 to 1,5	dB
Flatness of frequency response					
f = 40 MHz to 450 MHz	F_L	≤	± 0,2	± 0,2	dB
Return losses at input and output					
$Z_S = Z_L = 75\ \Omega$					
f = 40 to 80 MHz	S_{11-22}	≥	20	20	dB
f = 80 to 160 MHz		≥	19	19	dB
f = 160 to 450 MHz		≥	18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 440,25 MHz $V_q = V_o$ −6 dB; f_q = 447,25 MHz $V_r = V_o$ −6 dB; f_r = 449,25 MHz Measured at $f_{(p+q-r)}$ = 438,25 MHz	V_o	≥	60	62,5	dBmV
2nd order distortion					
V_o = 46 dBmV; channel 2 V_o = 46 dBmV; channel H5 Measured at channel H14	d_2	≤	−70	−70	dB
Composite triple beat 60 channels					
V_o = 46 dBmV; channel H22	CTB	≤	−55	−58	dB
Cross modulation distortion					
V_o = 46 mVdB; 60 channels Measured at channel 2	X_{mod}	≤	−57	−60	dB
Noise figure					
f = 40 MHz to 450 MHz	F	≤	6,5	7,0	dB
Total d.c. current consumption	I_{tot}	typ.	180	220	mA
		≤	200	240	mA

CATV AMPLIFIER MODULES

Hybrid amplifier modules for CATV systems operating at frequencies up to 450 MHz.

BGY84A: 18,5 dB input amplifier module
BGY85A: 18,5 dB output amplifier module

Features:

- excellent linearity;
- extremely low noise;
- optimal reliability ensured by TiPtAu metallized crystals, silicon nitride passivation and rugged construction.

QUICK REFERENCE DATA

		BGY84A	BGY85A	
Frequency range	f	40 to 450	40 to 450	MHz
Source impedance and load impedance	$Z_S = Z_L$	75	75	Ω
Power gain at f = 50 MHz	G_p	18,4 ± 0,4	18,4 ± 0,4	dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L	0,3 to 1,5	0,3 to 1,5	dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽ ± 0,2	± 0,2	dB
Return losses at input and output				
f = 40 MHz	$S_{11\text{-}22}$	⩾ 20	20	dB
f = 450 MHz		⩾ 18	18	dB
Output voltage at d_{im} = −60 dB (DIN 45004B, par. 6.3: 3-tone)	V_o	⩾ 60	62,5	dBmV
2nd order distortion V_o = 46 dBmV	d_2	⩽ −72	−72	dB
Composite triple beat 60 channels V_o = 46 dBmV	CTB	⩽ −55	−59	dB
Cross modulation distortion V_o = 46 dBmV; 60 channels	X_{mod}	⩽ −58	−61	dB
Noise figure f = 40 MHz to 450 MHz	F	⩽ 6,5	7,0	dB
D.C. supply voltage	$+V_B$	24	24	V*
Total d.c. current consumption at V_B = + 24 V	I_{tot}	typ. 180	220	mA

MECHANICAL DATA

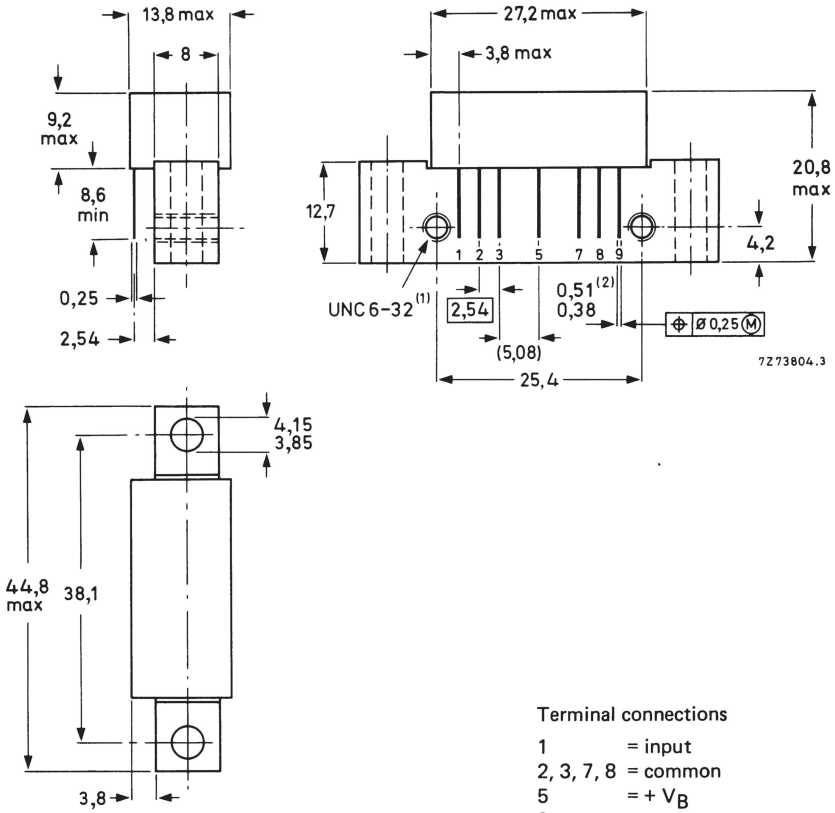
SOT-115 (see Fig. 1).

* The modules normally operate at V_B = 24 V, but are able to withstand supply transients up to 30 V.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-115.



Terminal connections

1	= input
2, 3, 7, 8	= common
5	= + V_B
9	= output

→ (1) Screw 6-32UNC-2A available on request (see "Accessories").
(2) Leads gold-plated.

Soldering recommendations

The maximum permissible temperature of the soldering iron is 260 °C for a contact time of maximum 3 s, when the soldered joints are 3 mm or more from the module.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

R.F. input voltage	V_i	max.	65 dBmV
Storage temperature	T_{stg}	−40 to + 100	°C
Operating mounting base temperature	T_{mb}	−20 to + 100	°C

CHARACTERISTICS

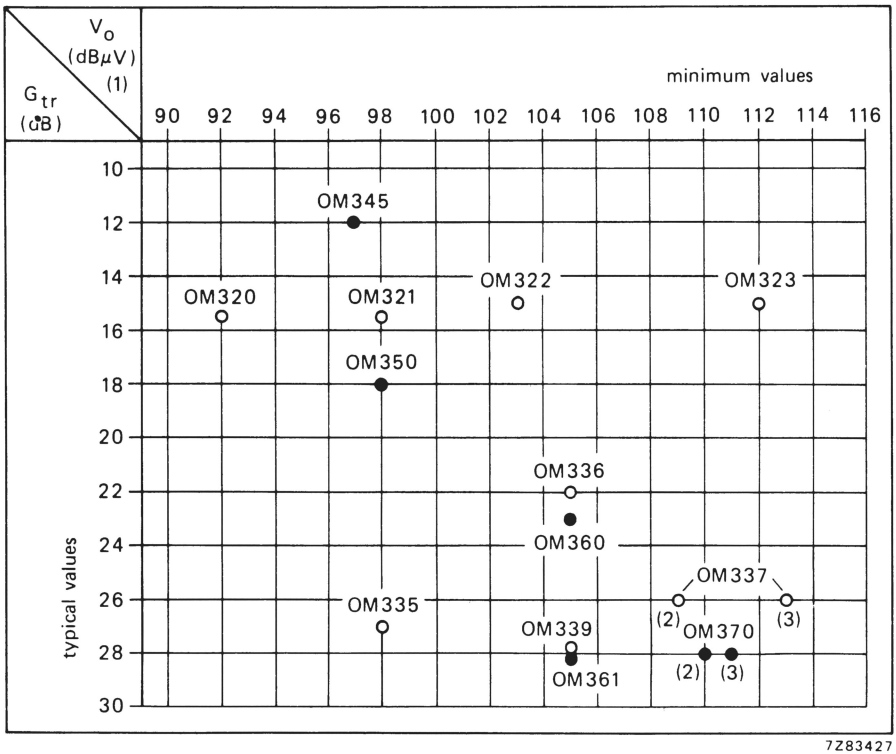
Supply voltage V_B = + 24 V; T_{mb} = 30 °C

		BGY84A	BGY85A
Power gain at f = 50 MHz	G_p	18,4 ± 0,4	18,4 ± 0,4 dB
Power gain at f = 450 MHz	G_p	18,7 to 20,2	18,7 to 20,2 dB
Slope cable equivalent f = 40 MHz to 450 MHz	S_L	+ 0,3 to 1,5	+ 0,3 to 1,5 dB
Flatness of frequency response f = 40 MHz to 450 MHz	F_L	⩽ ± 0,2	± 0,2 dB
Return losses at input and output $Z_S = Z_L = 75\ \Omega$			
f = 40 to 80 MHz	S_{11-22}	⩾ 20	20 dB
f = 80 to 160 MHz	S_{11-22}	⩾ 19	19 dB
f = 160 to 450 MHz	S_{11-22}	⩾ 18	18 dB
Output voltage at d_{im} = −60 dB (DIN 45004B, 6.3: 3-tone) $V_p = V_o$; f_p = 440,25 MHz $V_q = V_o$ −6 dB; f_q = 447,25 MHz $V_r = V_o$ −6 dB; f_r = 449,25 MHz Measured at $f_{(p+q-r)}$ = 438,25 MHz	V_o	⩾ 60	62,5 dBmV
2nd order distortion V_o = 46 dBmV; channel 2 V_o = 46 dBmV; channel H5 Measured at channel H14	d_2	⩽ −72	−72 dB
Composite triple beat 60 channels V_o = 46 dBmV; channel H22	CTB	⩽ −55	−59 dB
Cross modulation distortion V_o = 46 dBmV; 60 channels Measured at channel 2	X_{mod}	⩽ −58	−61 dB
Noise figure f = 40 MHz to 450 MHz	F	⩽ 6,5	7,0 dB
Total d.c. current consumption	I_{tot}	typ. 180 ⩽ 200	220 mA 240 mA

DEVICE DATA

Hybrid ICs for wideband amplifiers

HYBRID ICs FOR WIDE-BAND AMPLIFIERS



(1) At −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone).

(2) UHF.

(3) VHF.

Fig. 1 Type/performance in matrix survey.

The matrix survey (Fig. 1) and the tables next page show both the 12 V and 24 V ranges.

Note that the modules are available in the combination of high gain- high output voltage.

12 V supply voltage

	type	stage	gain (dB)	$V_{o(rms)}$ (dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2) input	max. VSWR typ. values (note 2) output	supply current (mA)	page
low	OM345	1	12	97	5,5	2,0	1,4	11,5	547
medium	OM350	2	18	98	6,0	1,5	1,9	18	553
medium	OM360	3	23	105	7,0	1,3	1,5	55	559
output	OM361	3	28	105	6,0	1,5	1,7	50	565
high output	OM370	3	28	111	7,0	2,3	1,9	105	571

24 V supply voltage

	type	stages	gain (dB)	$V_{o(rms)}$ (dBμV) −60 dB IMD (note 1) min. values	noise figure (dB)	max. VSWR typ. values (note 2) input	max. VSWR typ. values (note 2) output	supply current (mA)	page
low output	OM320	2	15,5	92	5,5	2,2	2,5	33	501
	OM321	2	15,5	98	6,0	2,5	2,0	33	507
	OM335	3	27	98	5,5	1,9	3,2	35	525
medium output	OM322	2	15	103	7,0	1,7	1,7	60	513
	OM336	3	22	105	7,0	1,4	1,6	65	531
	OM339	3	28	105	6,0	1,5	1,5	66	543
high output	OM323*	2	15	112	9,0	1,9	2,3	100	529
	OM337*	3	26	113	9,8	2,3	1,8	115	535

* Also available in A-version for external coil and output capacitor.

Notes

1. Measured at −60 dB intermodulation distortion to DIN 45004, par. 6.3: 3-tone, f = 470 MHz.
2. The typical maximum VSWR occurring in the frequency range 40-860 MHz, for a sample connected to a 75 Ω line.

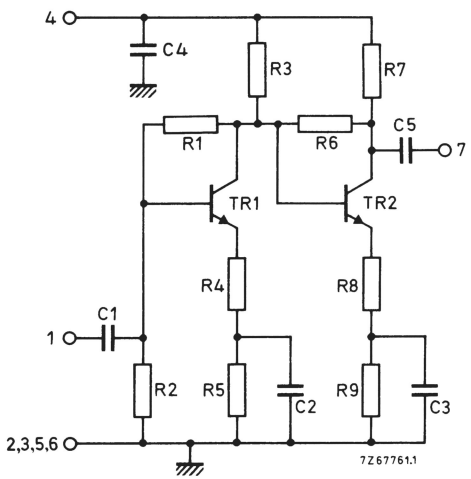
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	92	dBμV
Noise figure	F	typ.	5,5	dB
D.C. supply voltage	V_B	=	24	V ± 10%
Operating ambient temperature	T_{amb}	−20 to +70		°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, V_{7M}	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f		40 to 860	MHz

Performance

Supply current	I_B	typ.	23	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		13 to 18	dB
		typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,2	**
output	$VSWR_{(o)}$	typ.	2,5	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	30	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	24	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	92	dBμV
		typ.	94	dBμV
Noise figure	F	typ.	5,5	dB

s-parameters	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

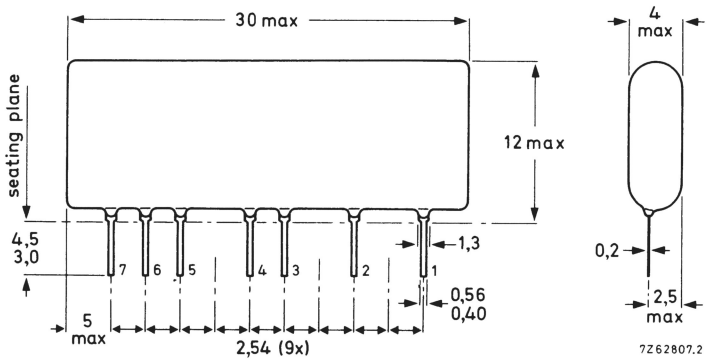
Ambient temperature range	T_{amb}		−20 to +70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1	= Input
2, 3, 5, 6	= Common
4	= Supply (+)
7	= Output

Soldering recommendations

Hand soldering

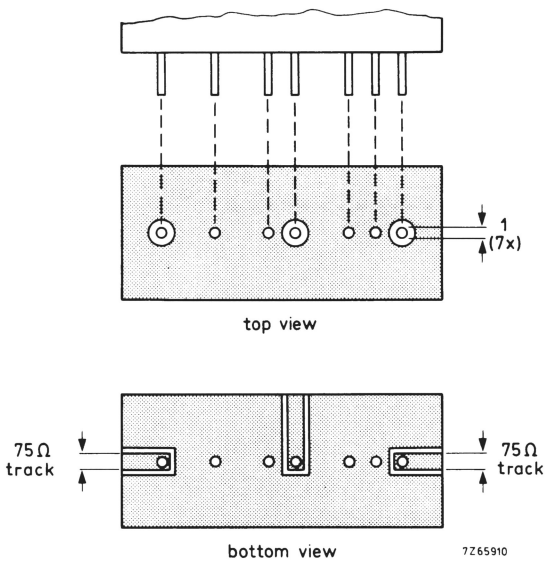
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

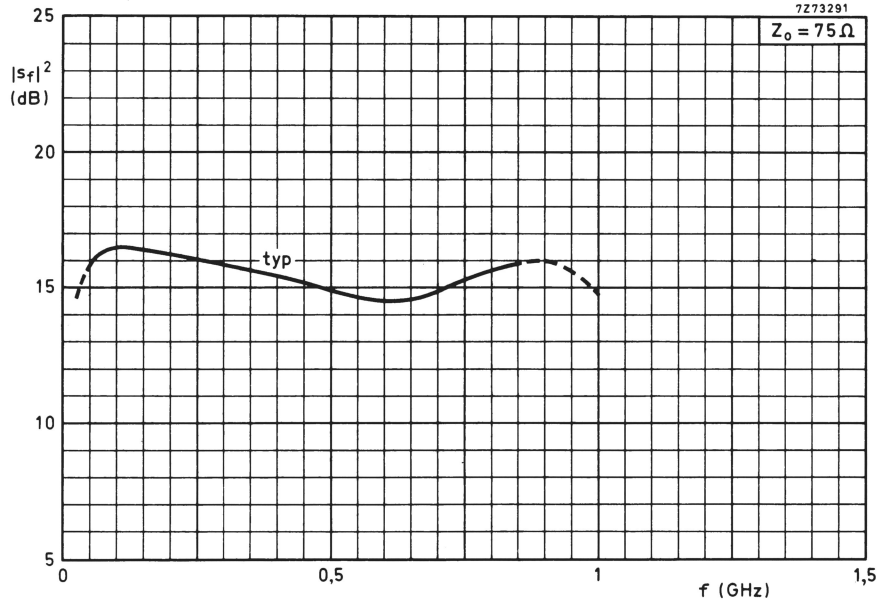
Dip or wave soldering

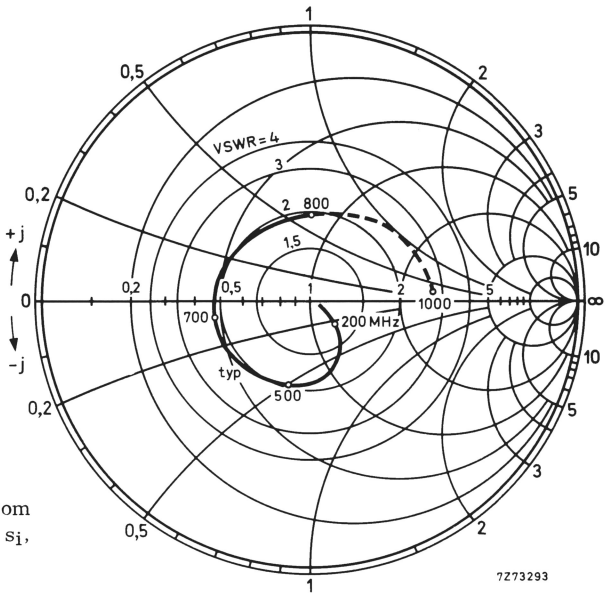
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

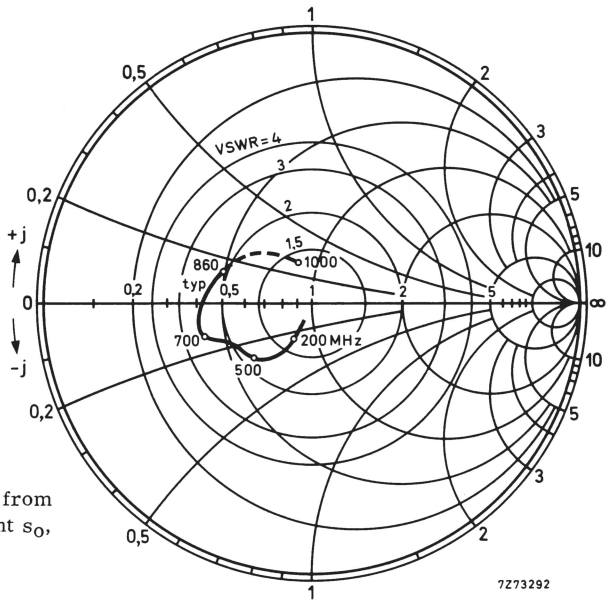
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible.







Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75.

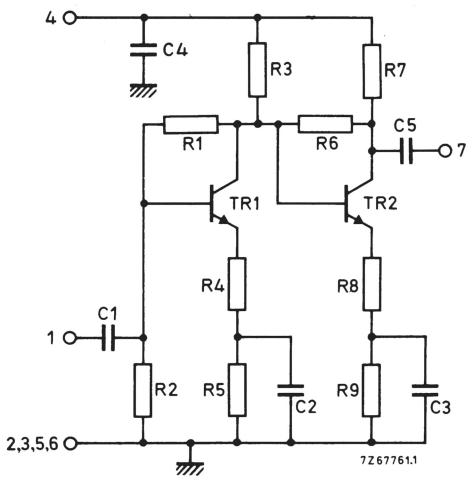
HYBRID VHF/UHF WIDE BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_\ell = Z_O$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	98	dBμV
Noise figure	F	typ.	6	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no.		3504 110 01840 *	
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_S, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	33	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		13 to 18	dB
		typ.	15,5	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,5	**
output	$VSWR_{(o)}$	typ.	2,0	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	30	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	26	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	98	dBμV
		typ.	100	dBμV
Noise figure	F	typ.	6	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

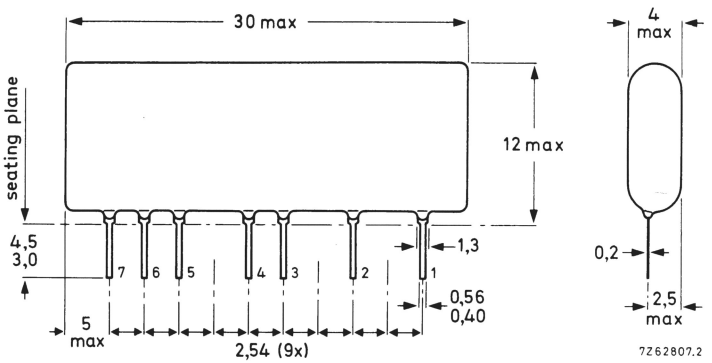
Ambient temperature range	T_{amb}		−20 to + 70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1	= Input
2, 3, 5, 6	= Common
4	= Supply (+)
7	= Output

Soldering recommendations

Hand soldering

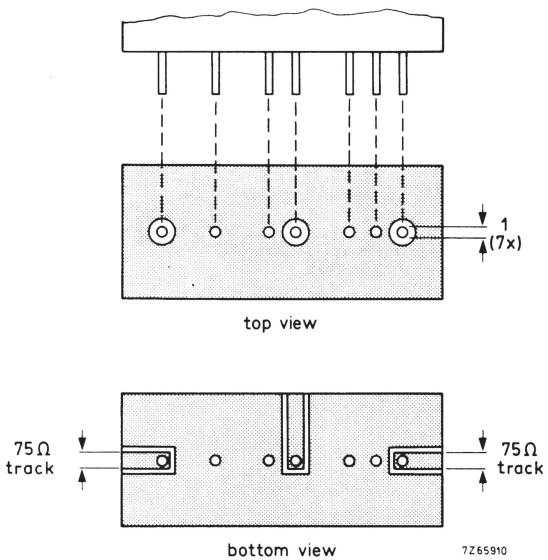
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

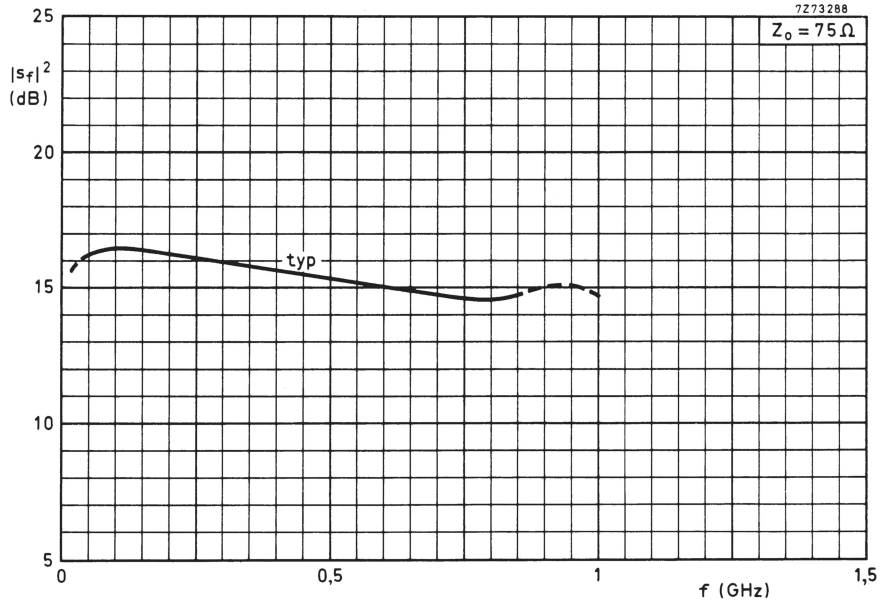
Dip or wave soldering

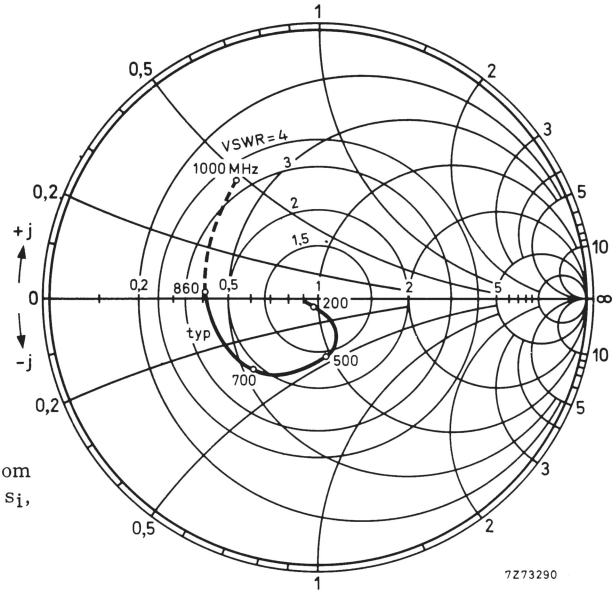
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

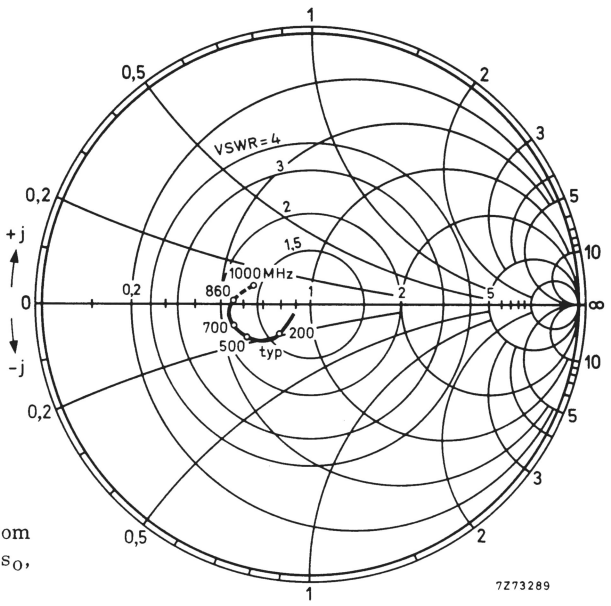
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible.







Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_O, co-ordinates in ohm x 75.

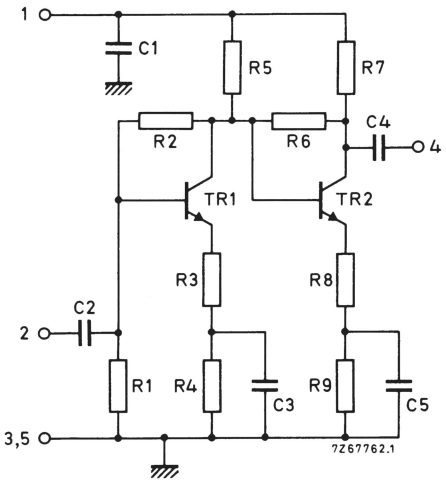
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use as distribution amplifier in MATV and CATV systems and as general-purpose amplifier for v.h.f. and u.h.f. applications. Except for the encapsulation coating, the OM322 and OM175 have the same specification. OM322 will replace OM175.

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_\ell = Z_O$		75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	0,3	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	103	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}	−20 to +70		°C

ENCAPSULATION 5-lead, resin coated body on metal base, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating ambient temperature	T_{amb}	−20 to +70		°C
Operating mounting-base temperature	T_{mb}	max.	100	°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 2 and 4	V_{2M}, V_{4M}	max.	28	V
	$-V_{2M}$, $-V_{4M}$	max.	10	V
Peak incident powers on pins 2 and 4	P_{I2M}, P_{I4M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B	typ.	60	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	14 to 16		dB
		typ.	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	0,3	dB
		<	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,7	[1]
output	$VSWR_{(o)}$	typ.	1,7	[1]
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	31	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	25	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	103	dBμV
		typ.	105	dBμV
Noise figure	F	typ.	7	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

[1]) Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

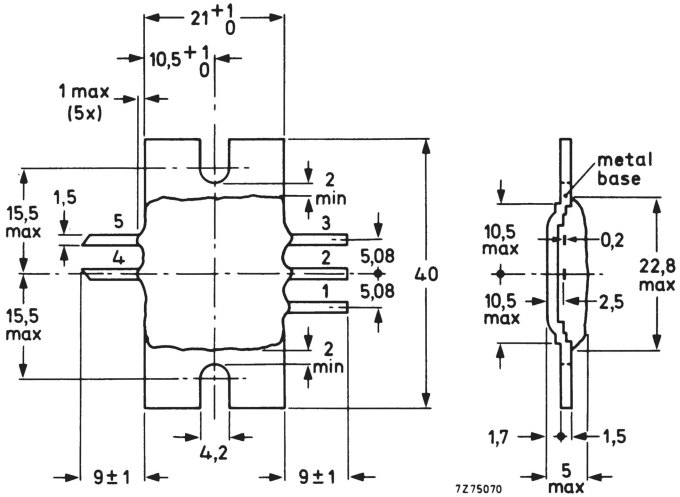
Ambient temperature range	T_{amb}		−20 to +70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_S, R_ℓ	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated and mounted on a metal mounting base.



Terminal connections

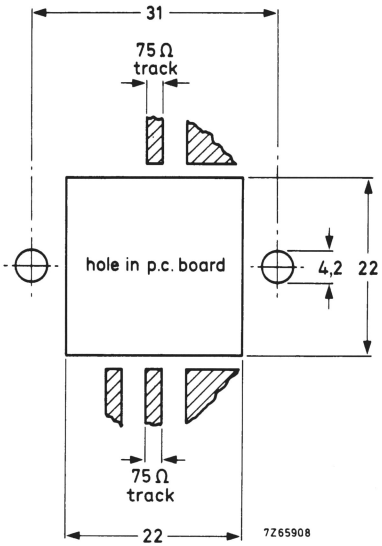
1	=	Supply (+)
2	=	Input
3 and 5	=	Common (internally connected to metal base)
4	=	Output

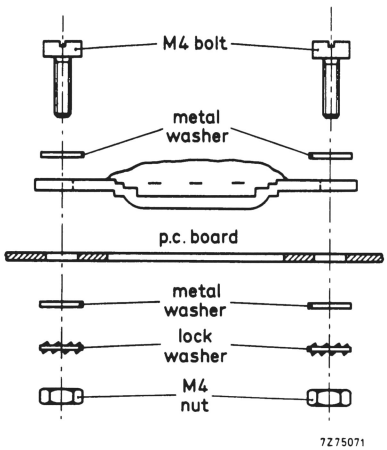
Soldering recommendations

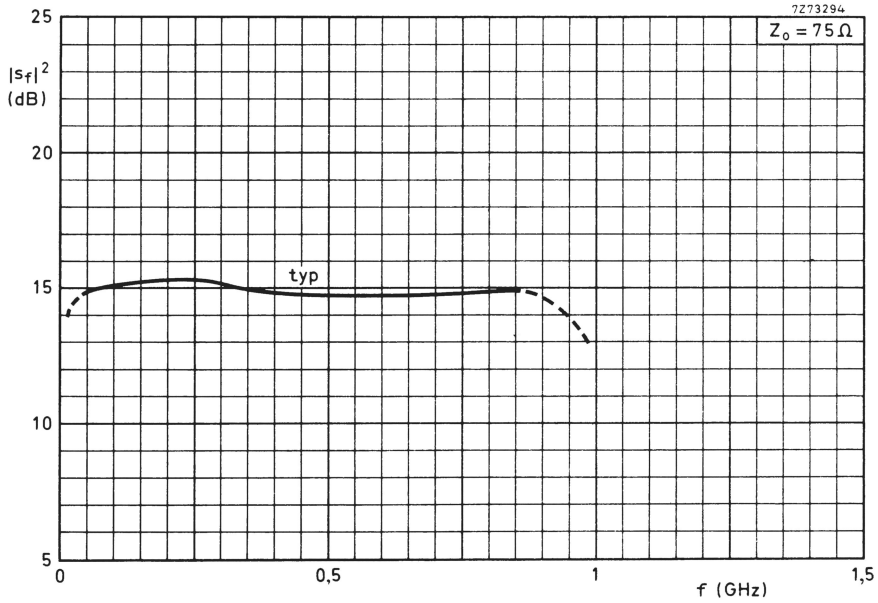
Maximum contact time for a soldering-iron temperature of 260 °C 5 s

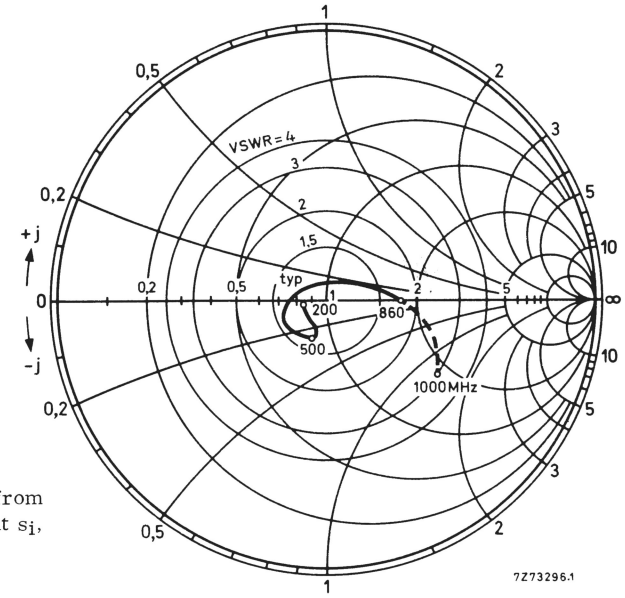
Mounting recommendations

The module should preferably be mounted on a double-sided printed-circuit board, see the examples shown below. Input and output should be connected to 75 Ω tracks.

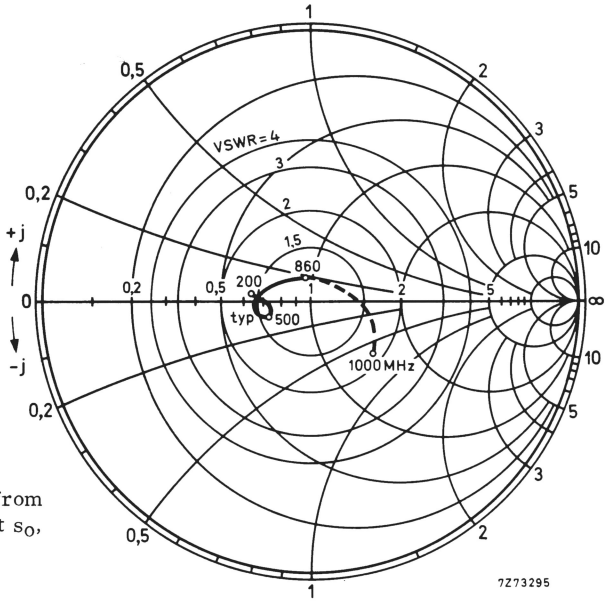








Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75



Output impedance derived from output reflection coefficient s_O, co-ordinates in ohm x 75

HYBRID V.H.F./U.H.F. WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in the hybrid technique, designed for use in MATV systems, and as general purpose amplifier for v.h.f. and u.h.f. applications requiring a high output level.
The OM323A needs an external collector-coil and blocking capacitor, whereas, the OM323 has these components built-in.

QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ 15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ 0,5	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone); f = 470 MHz	$V_{o(rms)}$	typ 113	dBμV
Noise figure	F	typ 9	dB
D.C. supply voltage	V_B	= 24	V ± 10%
Operating mounting-base temperature	T_{mb}	−30 to +100	°C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

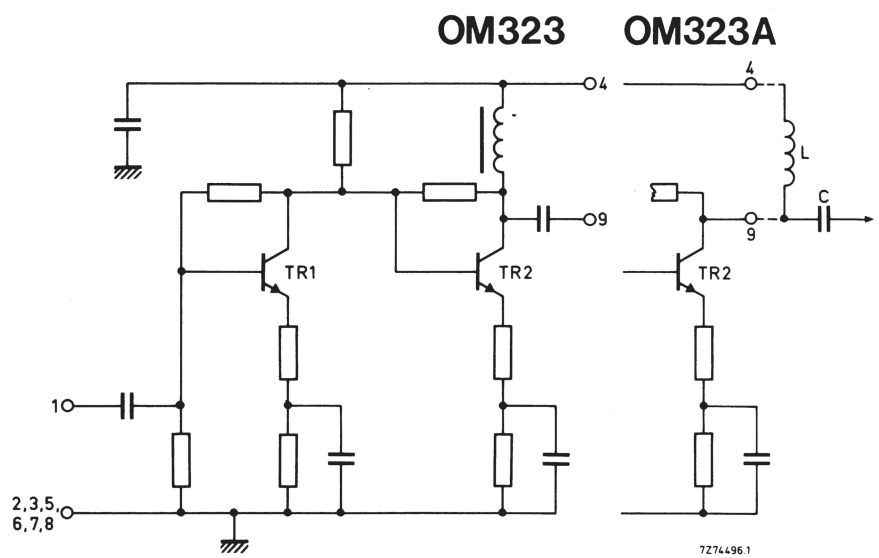


Fig. 1 Circuit diagram.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating mounting-base temperature	T_{mb}	−30 to +100		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max	28	V
Peak voltages on pin 1	V_{1M}	max	28	V
	$-V_{1M}$	max	24	V
Peak voltages on pin 9	V_{9M}	max	28	V
	$-V_{9M}$	max	4	V
Peak incident powers on pins 1 and 9	P_{I1M}, P_{I9M}	max	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.–U.H.F. test socket	catalogue no. 3504 110 01830 *			
Mounting base temperature	T_{mb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B		95 to 105	mA
		typ	100	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		14 to 17	dB
		typ	15	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ	1,9	**
output	$VSWR_{(o)}$	typ	2,3	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ	29	dB
f = 650 MHz	$\lvert s_r \rvert^2$	typ	25,5	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ	24	dB

* This socket can be made available for customer reference purposes.
** Highest value, for a sample, occurring in the frequency range.

Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)				
f = 40–230 MHz	$V_{o(rms)}$	>	112	dBμV
		typ	114	dBμV
f = 470 MHz	$V_{o(rms)}$	typ	113	dBμV
f = 860 MHz	$V_{o(rms)}$	typ	112	dBμV
Noise figure				
channel 2	F	typ	8	dB
channel 65	F	typ	9	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

OPERATING CONDITIONS

Mounting-base temperature range	T_{mb}		−30 to +100	°C
D.C. supply voltage	V_B	=	24	V ± 10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

THERMAL DATA

a. The maximum permissible temperature at the mounting base is 100 °C.

b. When the mounting tab is screwed to a double-sided printed-circuit board with dimensions 37 mm x 51 mm, its temperature will be 57 °C above the temperature of the surrounding free air.

c. When a heatsink is fixed to the mounting tab and the pins are soldered into a double-sided printed-circuit board with dimensions 37 mm x 51 mm, the tab will reach the temperatures stated in the following table.

Notes

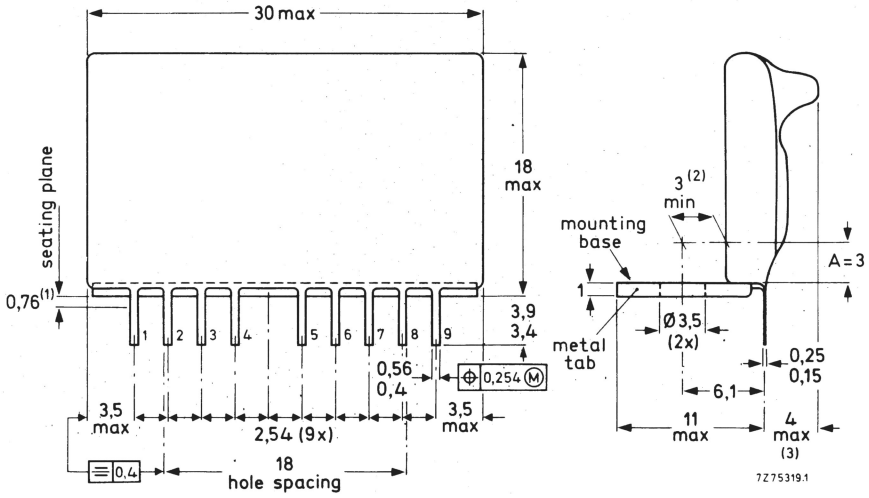
1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by fixing the tab to any convenient part of the equipment (e.g. a wall of the metal cabinet).

heatsink data thickness 1 mm	$T_{mb} - T_{amb}$ °C	$T_{amb\ max}$ °C
Bright aluminium heatsink L-shaped bar, length 100 mm, height 165 mm	24	76
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	23	77

MECHANICAL DATA

Dimensions in mm

The amplifier is resin coated and has a metal mounting tab at a right angle to the encapsulation part.



(1) Tolerance applies within this zone.
(2) Distance applies within zone A.
(3) For the OM323A: 3 mm maximum.

Fig. 2 Encapsulation.

Terminal connections

1 = Input
2, 3, 5, 6, 7, 8 = Common, connected to mounting tab
4 = Supply (+)
9 = Output

Soldering recommendations

Hand soldering

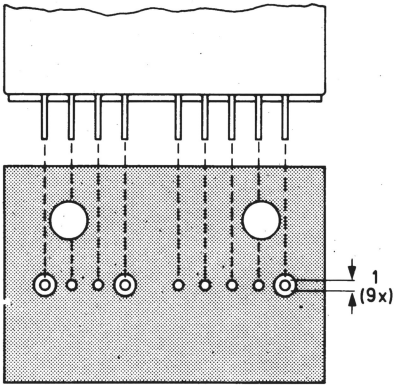
Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

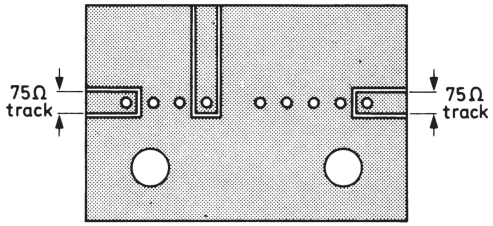
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

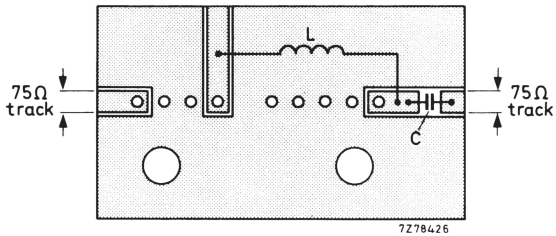
The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.
Input and output should be connected to 75 Ω tracks.
The connections to the common pins should be as close to the seating plane as possible.



top view



OM323: bottom view 7Z75320



OM323A: bottom view

Fig. 3 Printed-circuit board holes and tracks for the OM323 and OM323A.

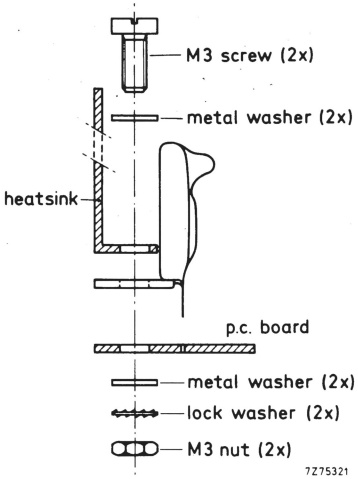


Fig. 4 Example of heatsink mounting.

L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

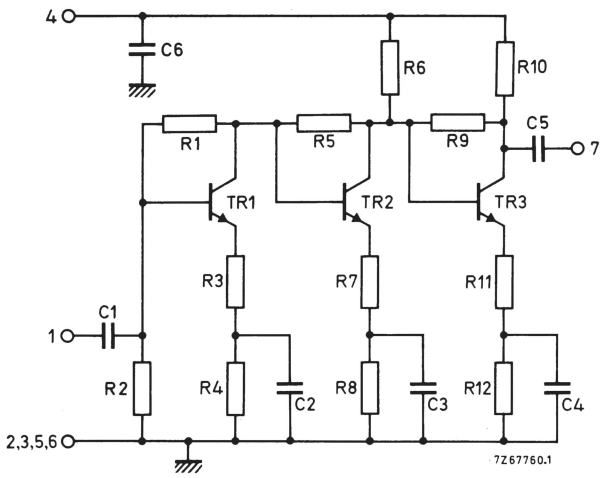
HYBRID VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as pre-amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA				
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_S = R_\ell = Z_O$	=	75	Ω
Transducer gain	$G_{tr} = \|s_f\|^2$	typ.	27	dB
Flatness of frequency response	$\pm\Delta \|s_f\|^2$	typ.	1,6	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone)	$V_{o(rms)}$	>	98	dBμV
Noise figure	F	typ.	5,5	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	35	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		23 to 31	dB
		typ.	27	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1,6	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,9	**
output	$VSWR_{(o)}$	typ.	3,2	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	46	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	40	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	98	dBμV
		typ.	101	dBμV
Noise figure	F	typ.	5,5	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

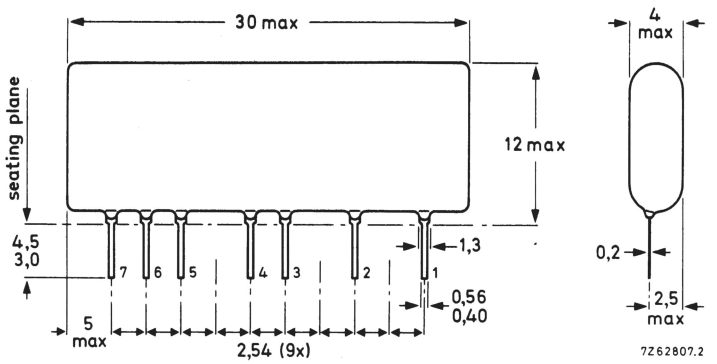
Ambient temperature range	T_{amb}		−20 to +70	°C
D.C. supply voltage	V_B	=	24	V ±10%
Frequency range	f		40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1	= Input
2, 3, 5, 6	= Common
4	= Supply (+)
7	= Output

Soldering recommendations

Hand soldering

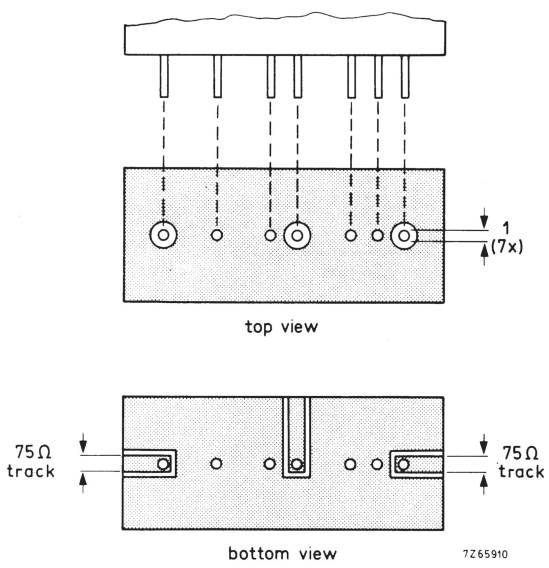
Maximum contact time for a soldering-iron temperature of 260 °C; up to seating plane: 5 s

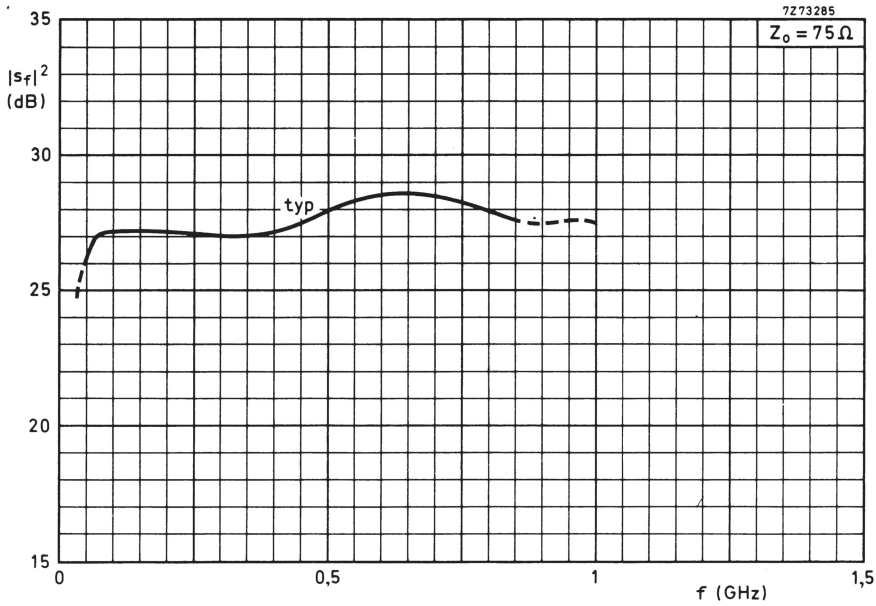
Dip or wave soldering

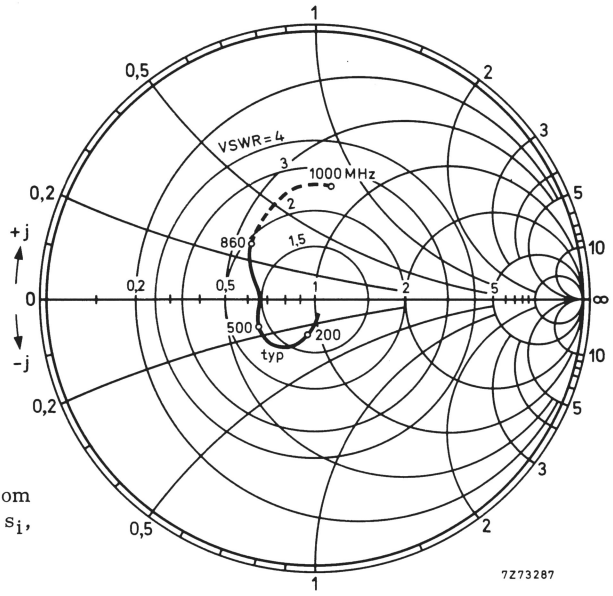
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds.
The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

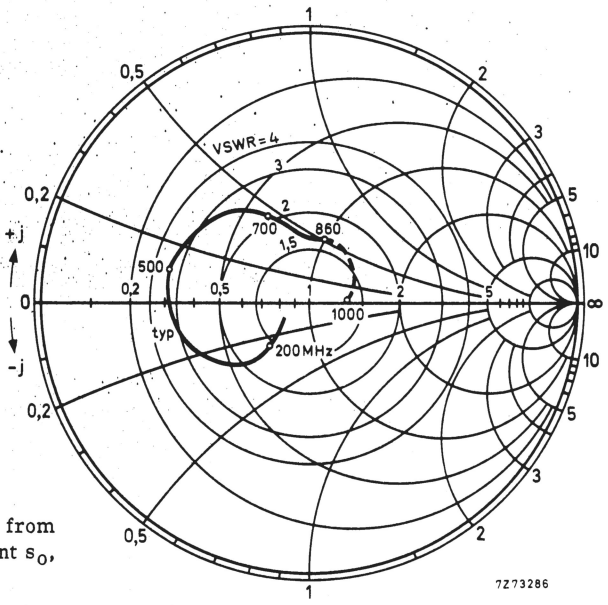
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.
Input and output should be connected to 75 Ω tracks.
The connections to the "common" pins should be as close to the seating plane as possible.







Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75.



Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75.

HYBRID VHF/UHF WIDE-BAND AMPLIFIER

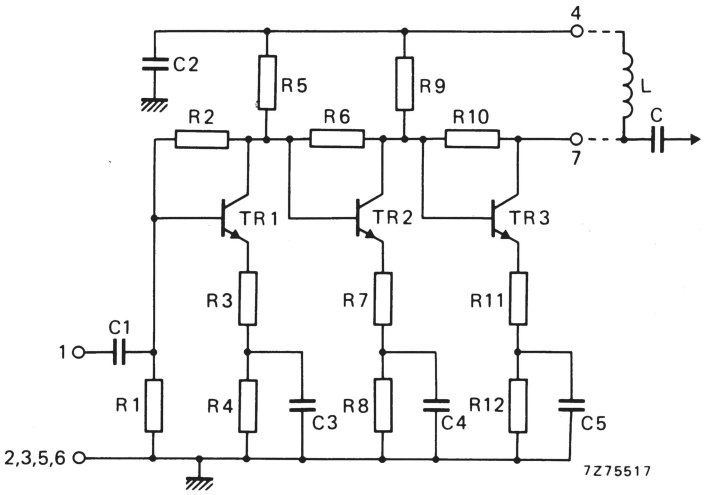
Three-stage wide-band amplifier in the hybrid technique, designed for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	22	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,0	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}	−20 to +70		°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA

CIRCUIT DIAGRAM



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to +70		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B	typ.	65	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	20 to 24		dB
		typ.	22	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,0	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,4	**
output	$VSWR_{(o)}$	typ.	1,6	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	42	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	40	dB
Output voltage				
at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	>	105	dBμV
		typ.	107	dBμV
Noise figure	F	typ.	7	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.

** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

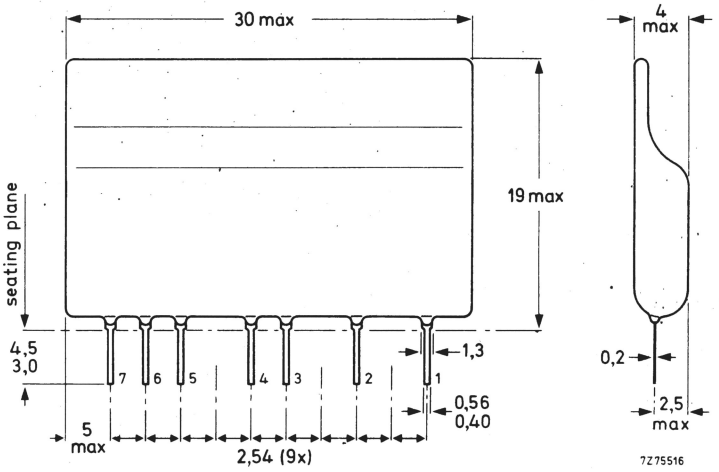
Ambient temperature range	T_{amb}	−20 to +70 °C
D.C. supply voltage	V_B	= 24 V ±10%
Frequency range	f	40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	= 75 Ω

MECHANICAL DATA

Dimensions in mm

Encapsulation

The device is resin coated.



Terminal connections

1 = Input
2, 3, 5, 6 = Common
4 = Supply (+)
7 = Output.

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

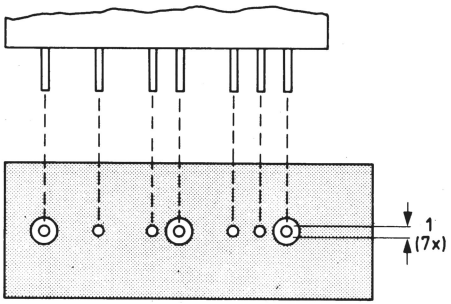
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

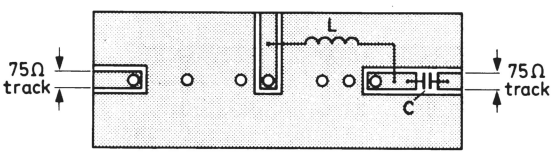
The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



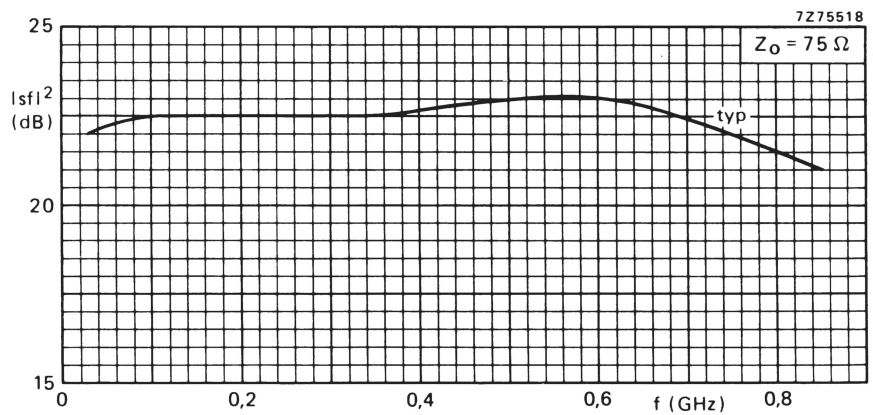
top view



bottom view

$L > 5\ \mu H$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.

$C > 220$ pF ceramic capacitor.



HYBRID V.H.F./U.H.F. WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid technique, designed for use in MATV systems, and as general purpose amplifier for v.h.f. and u.h.f. applications requiring a high output level.
The OM337A needs an external collector-coil and blocking capacitor, whereas, the OM337 has these components built-in.

QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ. 26	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ. 1	dB
Output voltage at −60 dB intermodulation distortion (DIN45004, 3-tone); f = 470 MHz	$V_{o(rms)}$	typ. 112	dBμV
Noise figure	F	typ. 9,8	dB
D.C. supply voltage	V_B	= 24	V ± 10%
Operating mounting-base temperature	T_{mb}	−30 to +100	°C

ENCAPSULATION 9-pin, in-line, resin-coated body on a right-angled metal mounting tab, see MECHANICAL DATA

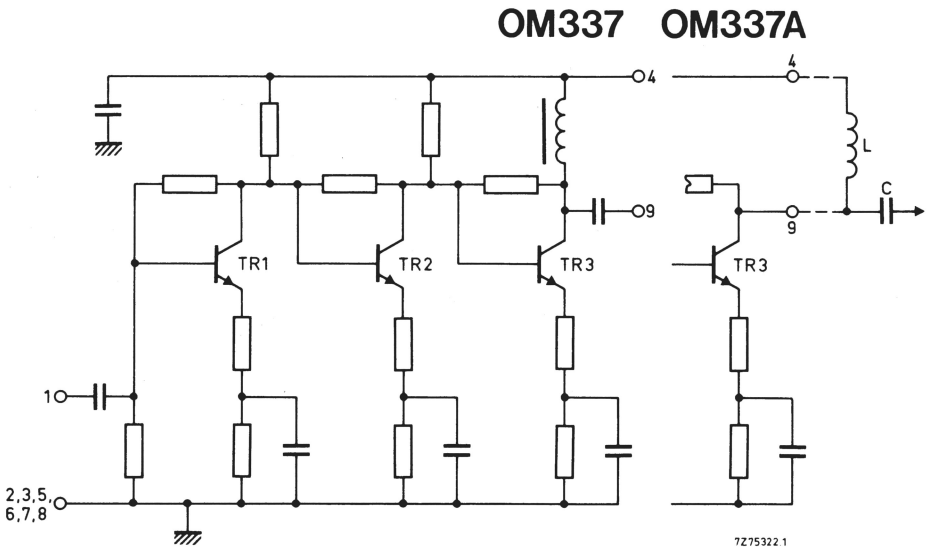


Fig. 1 Circuit diagram.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Operating mounting-base temperature	T_{mb}		−30 to +100	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pin 1	V_{1M}	max.	28	V
	$-V_{1M}$	max.	24	V
Peak voltages on pin 9	V_{9M}	max.	28	V
	$-V_{9M}$	max.	4	V
Peak incident powers on pins 1 and 9	P_{I1M}, P_{I9M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.–U.H.F. test socket	catalogue no.		3504 110 01830*	
Mounting base temperature	T_{mb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B		110 to 120	mA
		typ.	115	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$		23 to 29	dB
		typ.	26	dB
Flatness of frequency response	$\pm\Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,3	**
output	$VSWR_{(o)}$	typ.	1,8	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	44	dB
f = 650 MHz	$\lvert s_r \rvert^2$	typ.	41	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	43	dB

* This socket can be made available for customer reference purposes.
** Highest value, for a sample, occurring in the frequency range.

Output voltage
at −60 dB intermodulation distortion
(DIN45004, par. 6.3: 3-tone)

f = 40–230 MHz	$V_{o(rms)}$	> typ.	113 dBμV 114 dBμV
f = 470 MHz	$V_{o(rms)}$	typ.	112 dBμV
f = 860 MHz	$V_{o(rms)}$	typ.	110 dBμV
Noise figure			
channel 2	F	typ.	7 dB
channel 65	F	typ.	9,8 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

OPERATING CONDITIONS

Mounting-base temperature range	T_{mb}	−30 to +100	°C
D.C. supply voltage	V_B	= 24	V ± 10%
Frequency range	f	40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	= 75	Ω

THERMAL DATA

a. The maximum permissible temperature at the mounting base is 100 °C.

b. When the mounting tab is screwed to a double-sided printed-circuit board with dimensions 37 mm x 51 mm, its temperature will be 57 °C above the temperature of the surrounding free air.

c. When a heatsink is fixed to the mounting tab and the pins are soldered into a double-sided printed-circuit board with dimensions 37 mm x 51 mm, the tab will reach the temperatures stated in the following table.

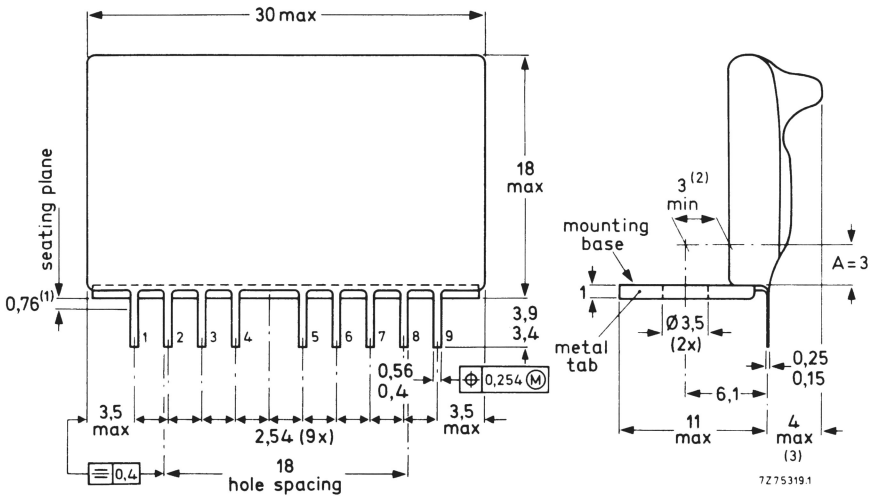
Notes:
1. When the device is fixed only to a heatsink, not to a printed-circuit board, the values of the second column of the table should be increased by 2 °C and those of the third column decreased by 2 °C.
2. The user is free to realize proper cooling by using differently shaped sinks, or, preferably, by fixing the tab to any convenient part of the equipment (e.g. a wall of the metal cabinet).

heatsink data thickness 1 mm	$T_{mb} - T_{amb}$ °C	$T_{amb\,max}$ °C
Bright aluminium heatsink L-shaped bar; length 100 mm, height 65 mm	27,5	72,5
Blackened aluminium heatsink L-shaped bar; length 50 mm, height 70 mm	26,5	73,5

MECHANICAL DATA

Dimensions in mm

The amplifier is resin coated and has a metal mounting tab at a right angle to the encapsulated part.



(1) Tolerance applies within this zone.
(2) Distance applies within zone A.
(3) For the OM337A: 3 mm maximum.

Fig. 2 Encapsulation.

Terminal connections

1 = Input
2, 3, 5, 6, 7, 8 = Common, connected to mounting tab
4 = Supply (+)
9 = Output

Soldering recommendations

Hand soldering

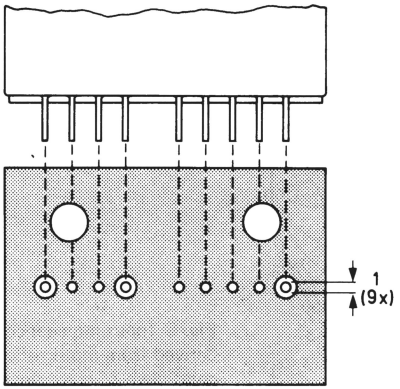
Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

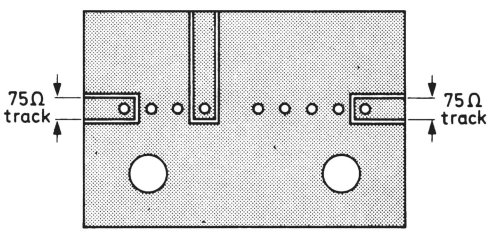
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

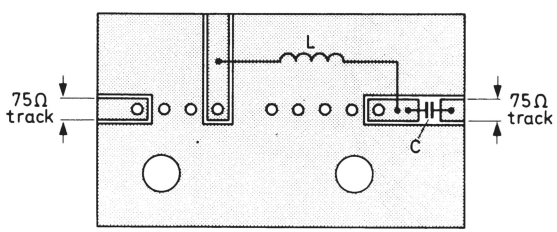
The module should preferably be mounted on a double-sided printed-circuit board, see the following example. An example is also given of heatsink mounting.
Input and output should be connected to 75 Ω tracks.
The connections to the common pins should be as close to the seating plane as possible.



top view



OM337: bottom view. 7Z75320



OM337A: bottom view.

Fig. 3 Printed-circuit board holes and tracks for the OM337 and OM337A.

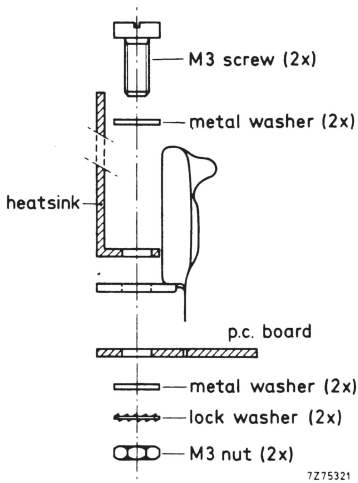


Fig. 4 Example of heatsink mounting.

L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

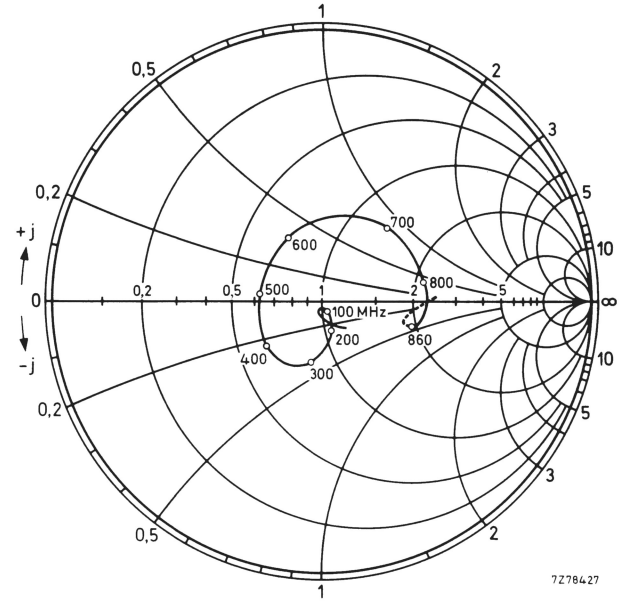


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

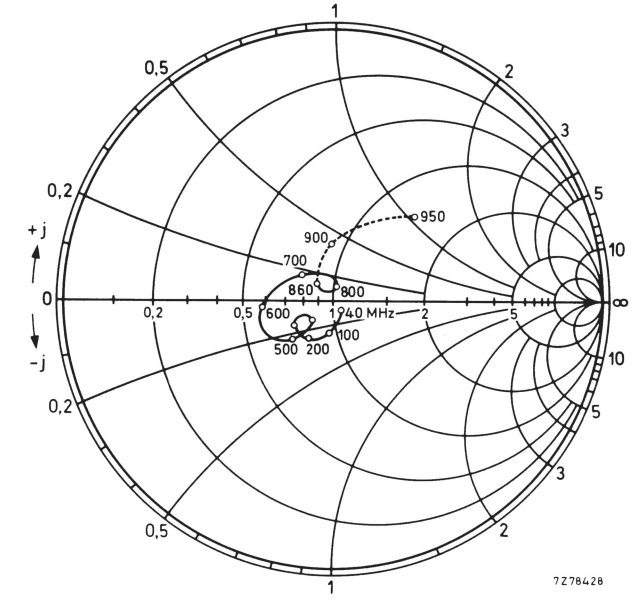


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

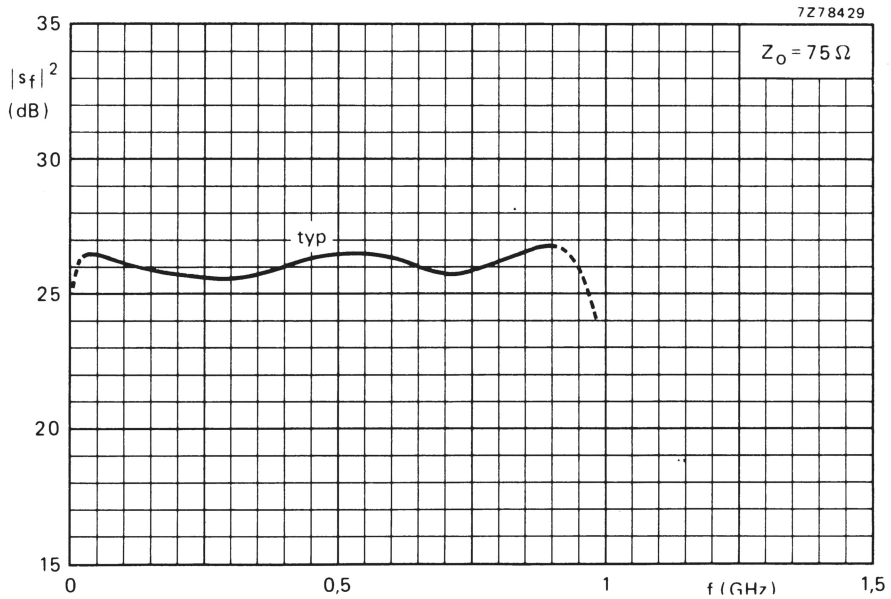


Fig. 7 Transducer gain as a function of frequency.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in the hybrid integrated circuit technique, designed for use in mast-head booster-amplifiers, as amplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	6	dB
D.C. supply voltage	V_B	=	24	V ±10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 7-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

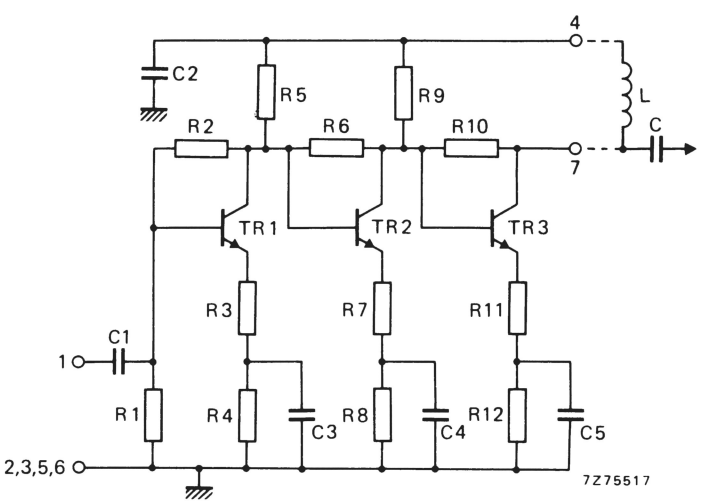


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to +70		°C
Storage temperature	T_{stg}	−40 to +125		°C
D.C. supply voltage	V_B	max.	28	V
Peak voltages on pins 1 and 7	V_{1M}, V_{7M}	max.	28	V
	$-V_{1M}$, $-V_{7M}$	max.	10	V
Peak incident powers on pins 1 and 7	P_{I1M}, P_{I7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

V.H.F.-U.H.F. test socket	catalogue no. 3504 110 01840 *			
Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	24	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	= 40 to 860		MHz

Performance

Supply current	I_B	typ.	67	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	25 to 30		dB
		typ.	28	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,5	**
output	$VSWR_{(o)}$	typ.	1,5	**
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	46	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	31	dB
Output voltage				
at −60 dB intermodulation distortion		>	105	dBμV
(DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ.	107	dBμV
Noise figure	F	typ.	6	dB

s-parameters:		
	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* This socket can be made available for customer reference purposes.
** Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to +70 °C
D.C. supply voltage	V_B	=	24 V ±10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

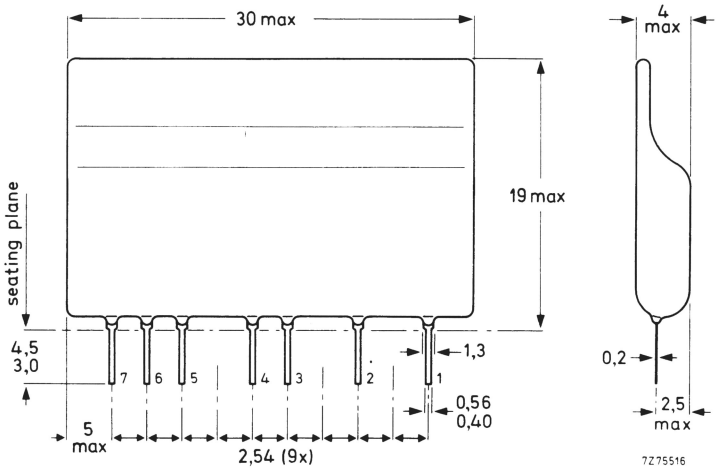


Fig. 2 Encapsulation.

Terminal connections

1 = input
2, 3, 5, 6 = common
4 = supply (+)
7 = output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

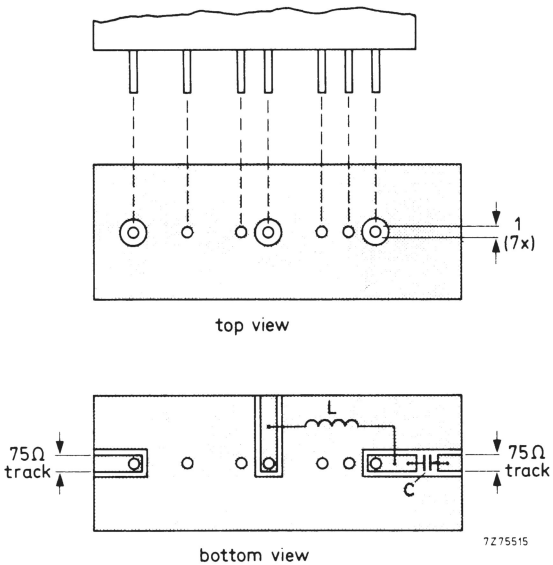
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

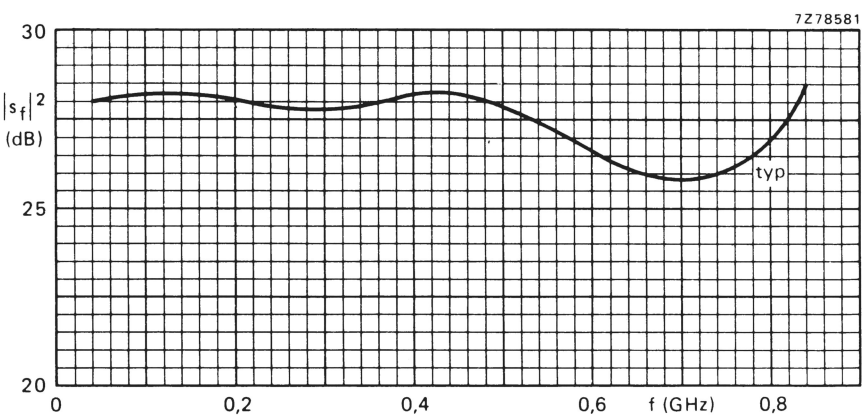


Fig. 4 Transducer gain as a function of frequency; Z_O = 75 Ω.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

One-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for aerial amplifiers in car radios, caravans or RATV and MATV applications.

QUICK REFERENCE DATA

D.C. supply voltage	V_B	=	12	V ± 10%
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	12	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	typ.	99	dBμV
Noise figure	F	typ.	5,5	dB
Operating ambient temperature	T_{amb}		−20 to + 70	°C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

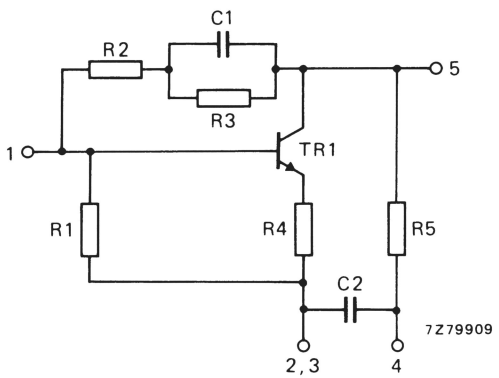


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	15	V
Peak incident powers on pins 1 and 5	P_{I1M}, P_{I5M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	12	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	11,5	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	12	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	2,0	*
output	$VSWR_{(o)}$	typ.	1,4	*
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	22	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	19	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ.	99	dBμV
Noise figure	F	typ.	5,5	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to + 70 °C
D.C. supply voltage	V_B	=	12 V ±10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

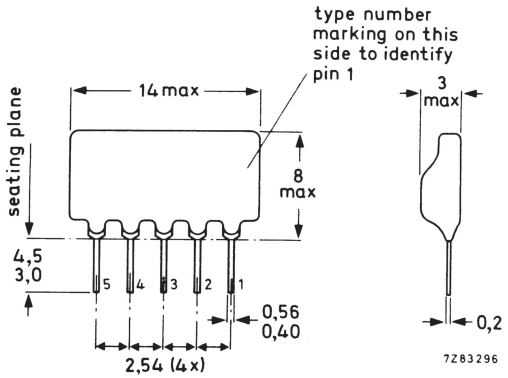


Fig. 2 Encapsulation.

Terminal connections

1 = input
2,3 = common
4 = supply (+)
5 = output

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.

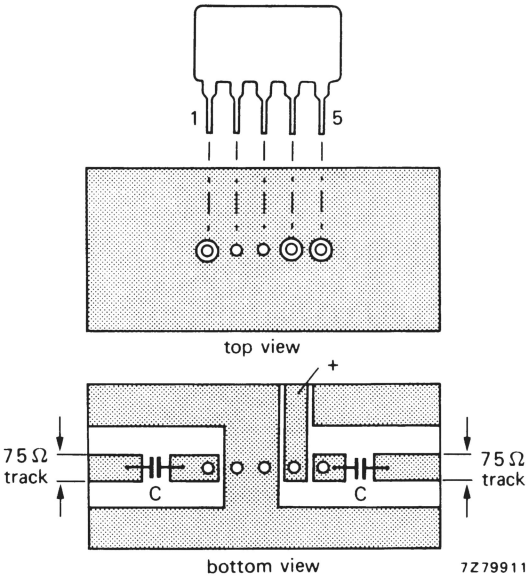


Fig. 3 Printed-circuit board holes and tracks.
C > 220 pF ceramic capacitor.

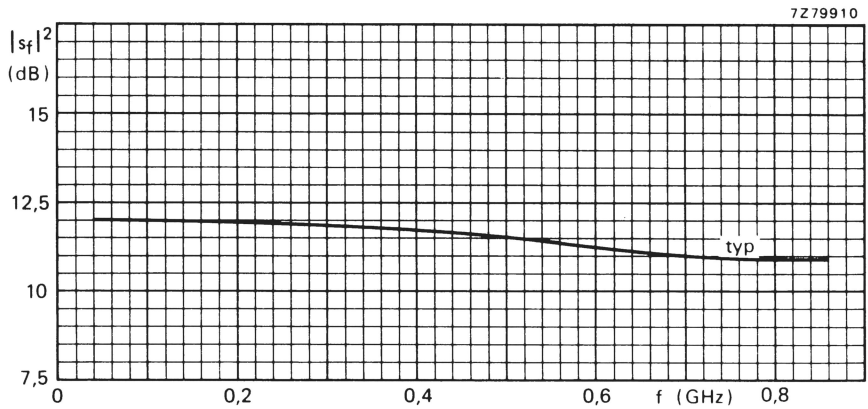


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

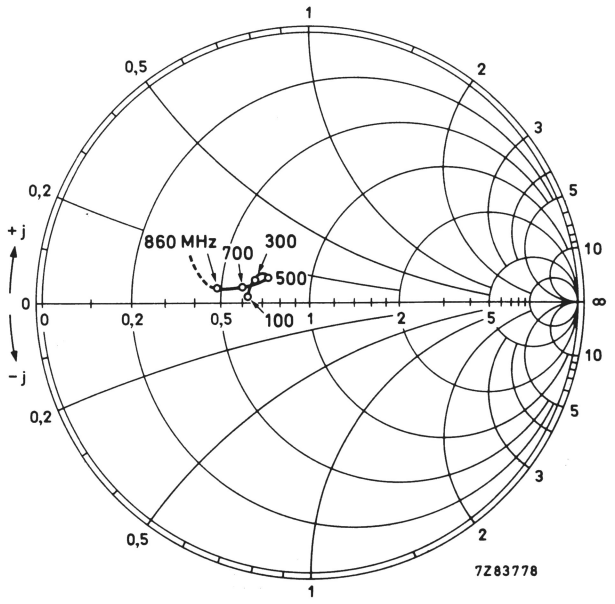


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

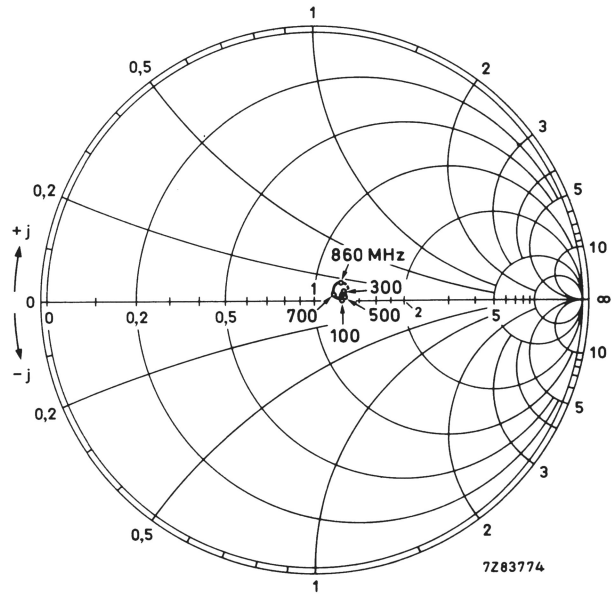


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

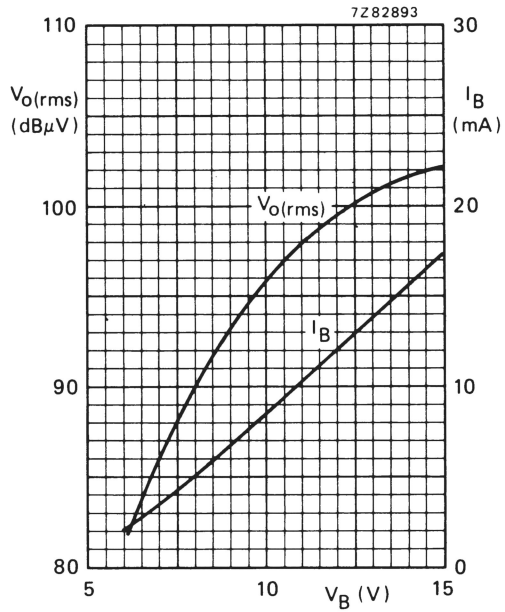


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

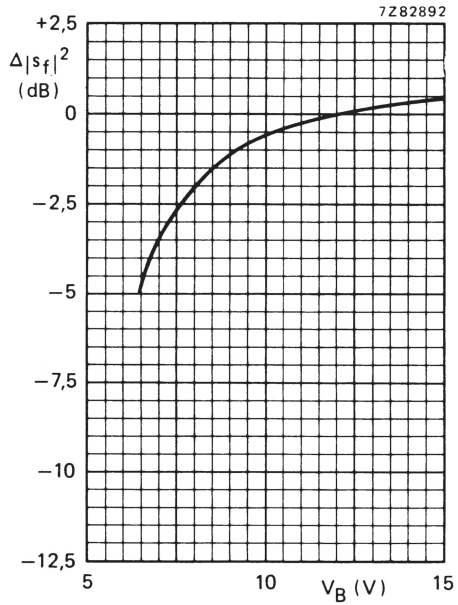


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V; f = 100 to 860 MHz; typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Two-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for RATV and MATV applications.

QUICK REFERENCE DATA

D.C. supply voltage	V_B	=	12	V ± 10%
Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	typ.	100	dBμV
Noise figure	F	typ.	6	dB
Operating ambient temperature	T_{amb}	−20 to +	70	°C

ENCAPSULATION 5-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

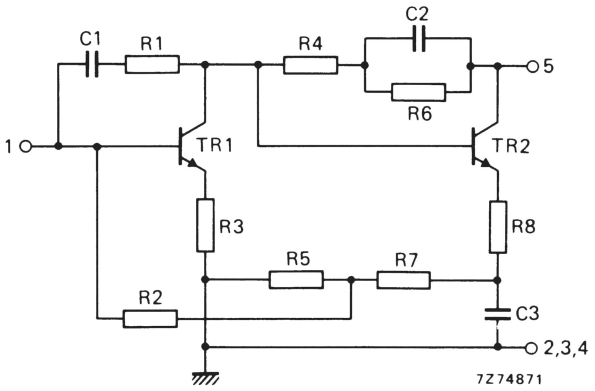


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}	−20 to	+ 70	°C
Storage temperature	T_{stg}	−40 to	+ 125	°C
D.C. supply voltage	V_B	max.	15	V
Peak incident powers on pins 1 and 5	P_{I1M}, P_{I5M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	12	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	18	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	18	dB
Flatness of frequency response	$\pm \Delta \lvert s_f \rvert^2$	typ.	1	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,5	*
output	$VSWR_{(o)}$	typ.	1,9	*
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	29	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	25	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6.3: 3-tone)	$V_{o(rms)}$	typ.	100	dBμV
Noise figure	F	typ.	6	dB

s-parameters: $s_f = s_{21}$ $s_i = s_{11}$ $s_r = s_{12}$ $s_o = s_{22}$

* Highest value, for a sample, occuring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	−20 to + 70	°C
D.C. supply voltage	V_B	= 12	V ± 10%
Frequency range	f	40 to 860	MHz
Source impedance and load impedance	R_S, R_ℓ	= 75	Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

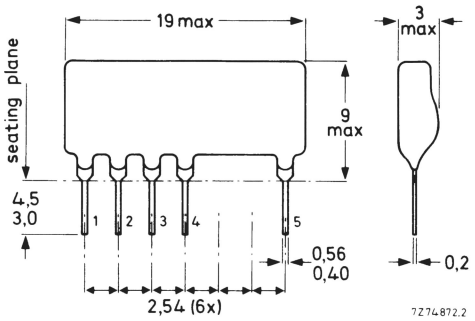


Fig. 2 Encapsulation.

Terminal connections

1 = input
2,3,4 = common
5 = output/supply(+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

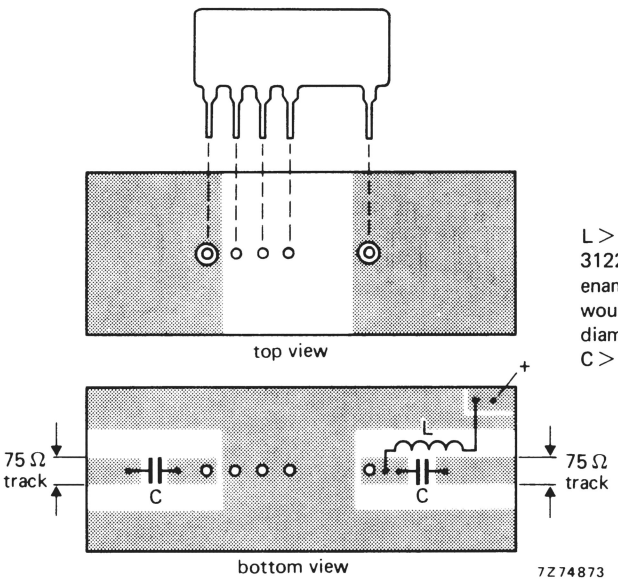
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

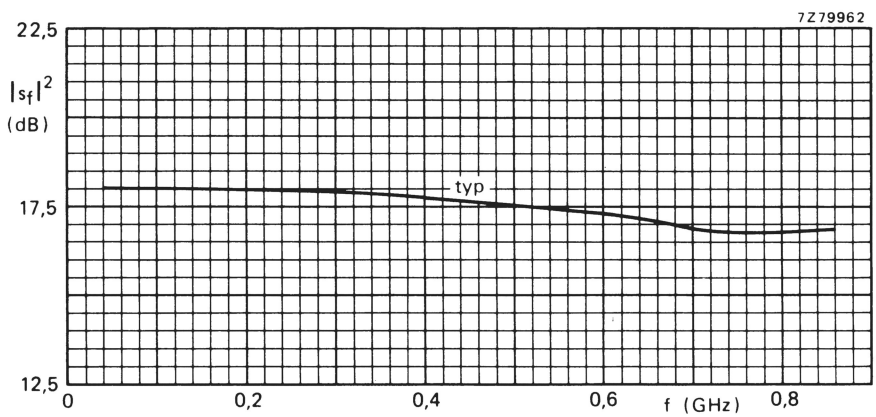


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

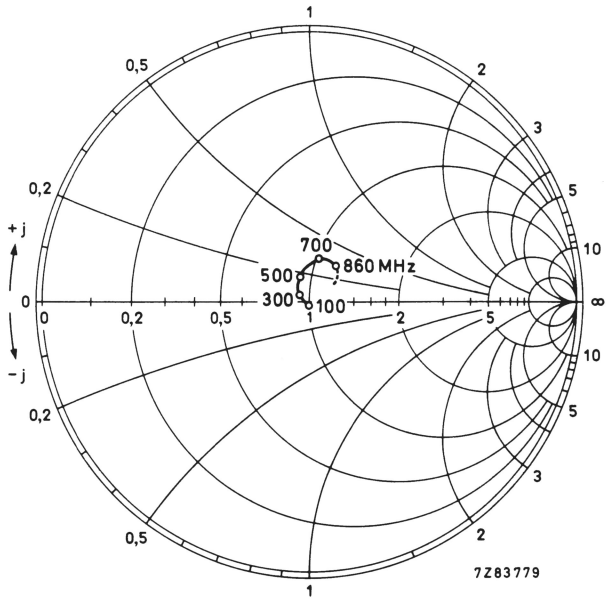


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

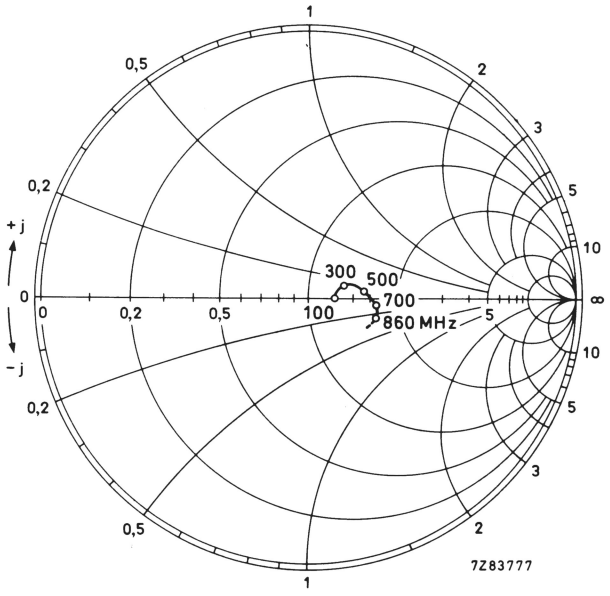


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

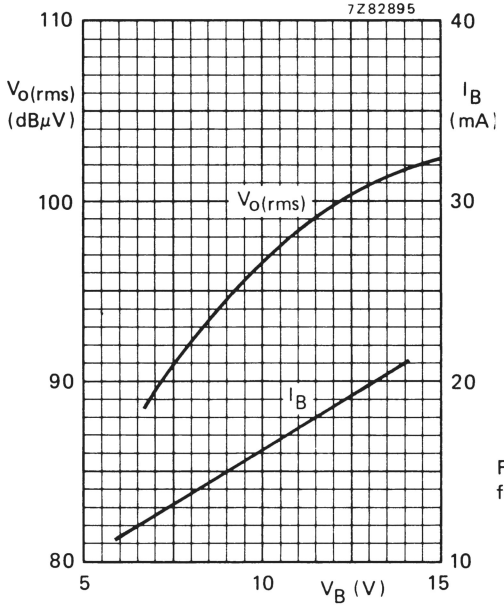


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

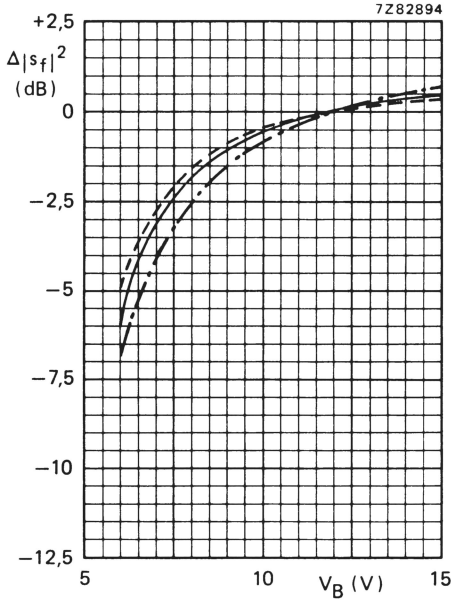


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V:
——— f = 500 MHz;
– – – – f = 100 MHz;
—·—·— f = 860 MHz;
typical values.

HYBRID INTEGRATED CIRCUIT VHF/UHF WIDE-BAND AMPLIFIER

Three-stage wide-band amplifier in hybrid integrated circuit technique on a thin-film substrate, intended for use in mast-head booster-amplifiers, as preamplifier in MATV systems, and as general-purpose amplifier for v.h.f. and u.h.f. applications.

QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	23	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	0,5	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	>	105	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

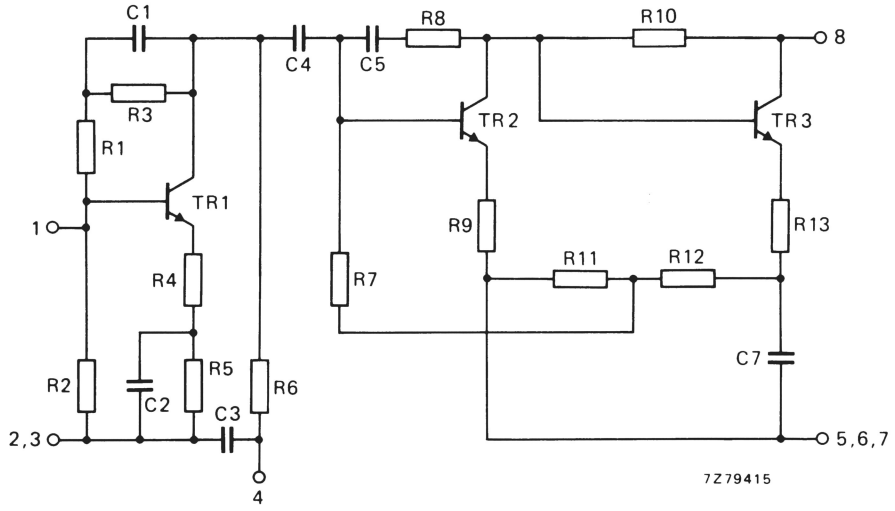


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70	°C
Storage temperature	T_{stg}		−40 to +125	°C
D.C. supply voltage	V_B	max.	15	V
Peak incident powers on pins 1 and 7	P_{l1M}, P_{l7M}	max.	100	mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25	°C
D.C. supply voltage	V_B	=	12	V
Source impedance and load impedance	R_s, R_ℓ	=	75	Ω
Characteristic impedance of h.f. connections	Z_o	=	75	Ω
Frequency range	f	=	40 to 860	MHz

Performance

Supply current	I_B	typ.	55	mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	23	dB
			21 to 25	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	0,5	dB
Individual maximum v.s.w.r.				
input	$VSWR_{(i)}$	typ.	1,3	*
output	$VSWR_{(o)}$	typ.	1,5	*
Back attenuation				
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	42	dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	33	dB
Output voltage				
at −60 dB intermodulation distortion	$V_{o(rms)}$	>	105	dBμV
(DIN 45004, par. 6.3: 3-tone)		typ.	107	dBμV
Noise figure	F	typ.	7	dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}	−20 to +70	°C
D.C. supply voltage	V_B	= 12	V ± 10%
Frequency range	f	40 to 860	MHz
Source impedance and load impedance	R_s, R_ℓ	= 75	Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

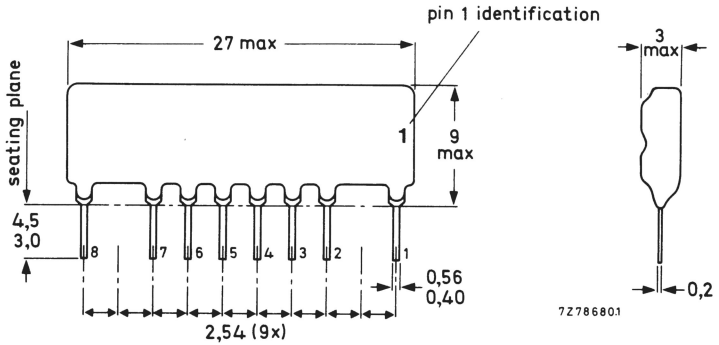


Fig. 2 Encapsulation.

Terminal connections

1 = input
2, 3, 5, 6, 7 = common
4 = supply (+)
8 = output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

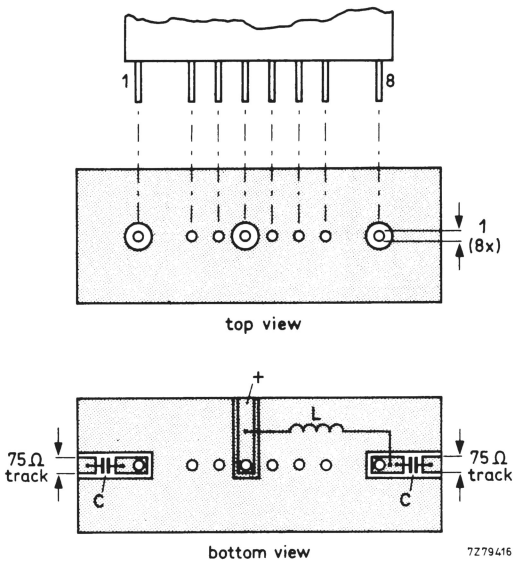
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

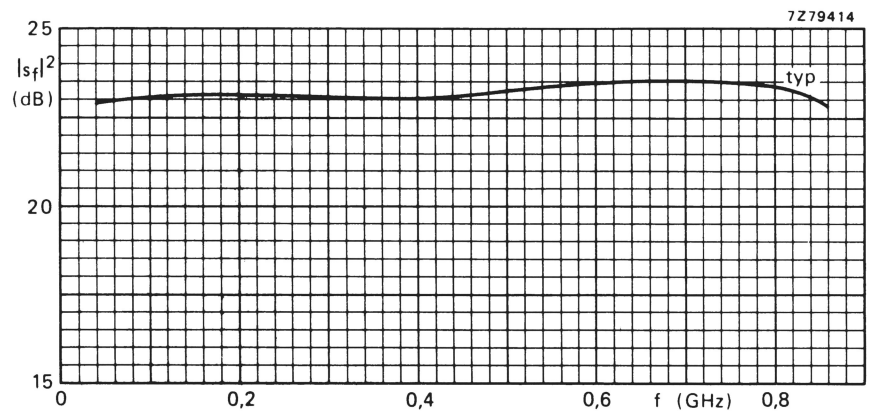


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

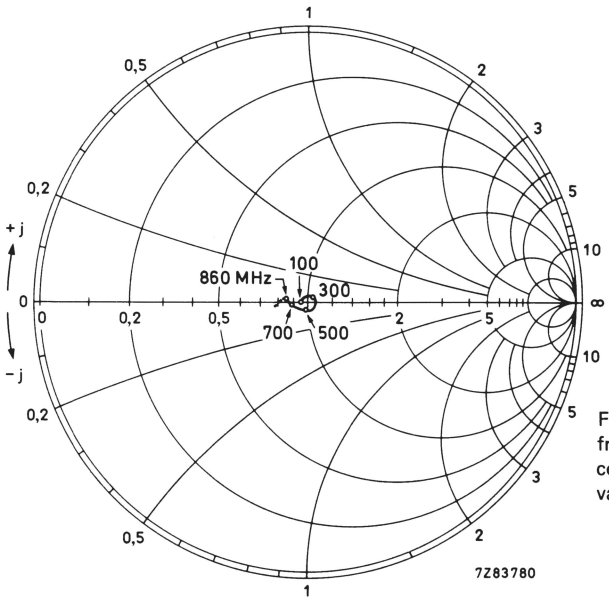


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

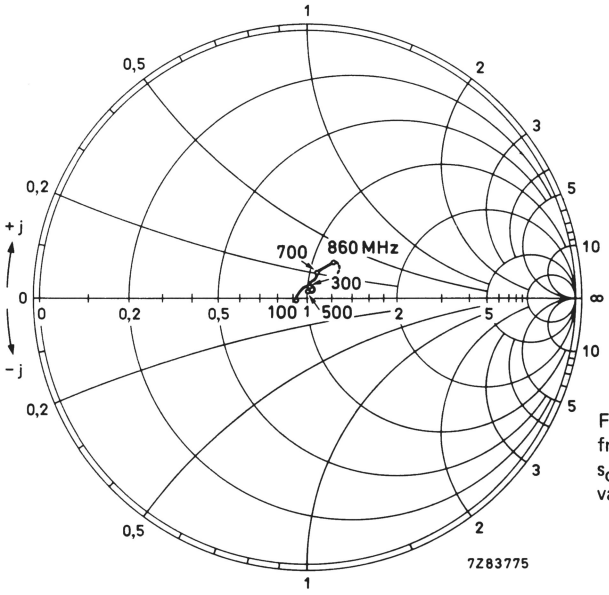


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

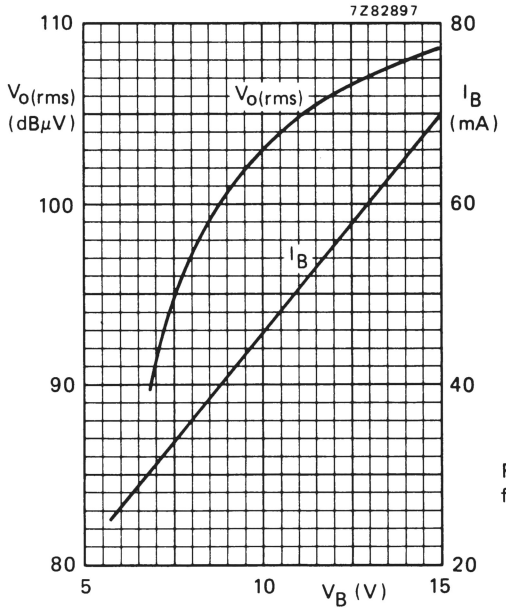


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

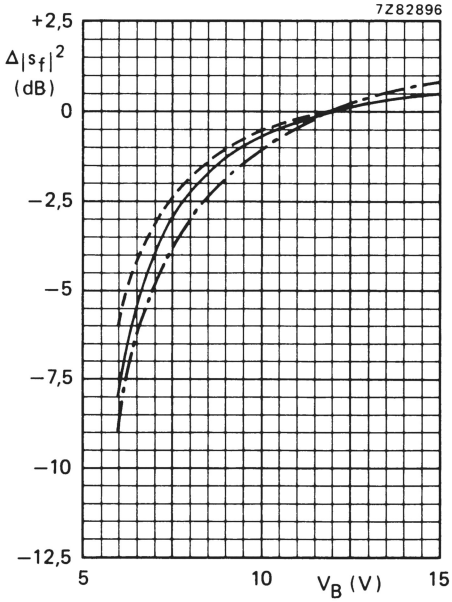


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—·—·— f = 860 MHz;
typical values.

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QUICK REFERENCE DATA

Frequency range	f	40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	= 75	Ω
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ. 28	dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ. 1	dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, 3-tone)	$V_{o(rms)}$	> 105	dBμV
Noise figure	F	typ. 6	dB
D.C. supply voltage	V_B	= 12	V ± 10%
Operating ambient temperature	T_{amb}	−20 to +70	°C

ENCAPSULATION 8-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig. 2)

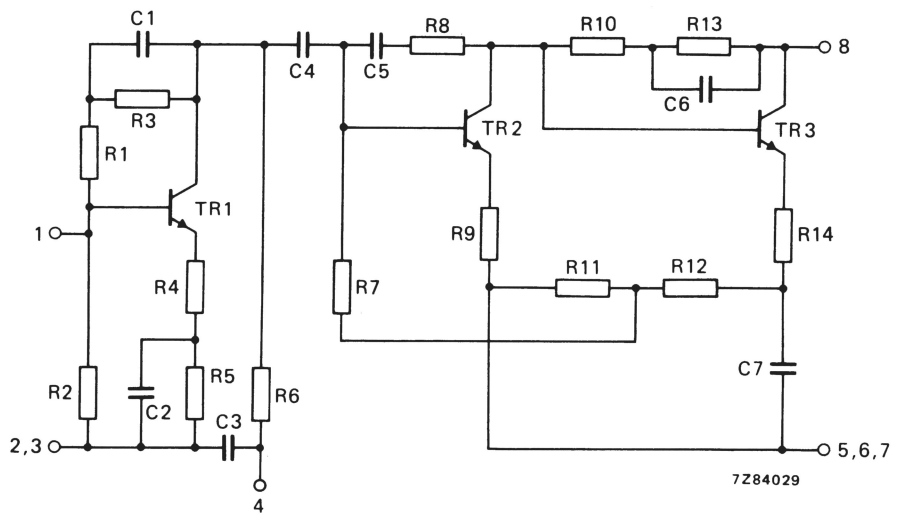


Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70 °C
Storage temperature	T_{stg}		−40 to +125 °C
D.C. supply voltage	V_B	max.	15 V
Peak incident powers on pins 1 and 8	P_{I1M}, P_{I8M}	max.	100 mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω
Characteristic impedance of h.f. connections	Z_o	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	50 mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	28 dB 26 to 31 dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ.	1,5 *
output	$VSWR_{(o)}$	typ.	1,7 *
Back attenuation			
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	45 dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	35 dB
Output voltage			
at −60 dB intermodulation distortion (DIN 45004, par. 6,3; 3-tone)	$V_{o(rms)}$	> typ.	105 dBμV 107 dBμV
Noise figure	F	typ.	6 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to +70 °C
D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_S, R_ℓ	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

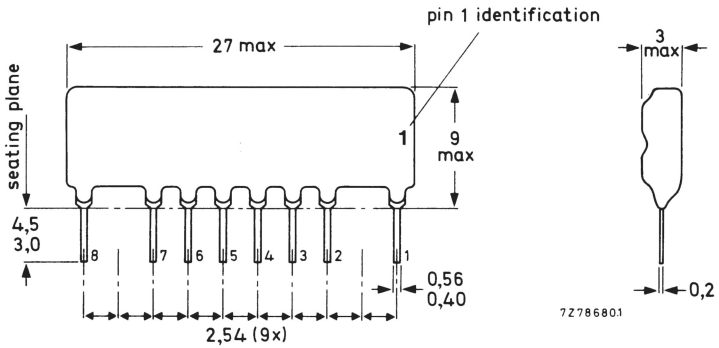


Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 5, 6, 7	= common
4	= supply (+)
8	= output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

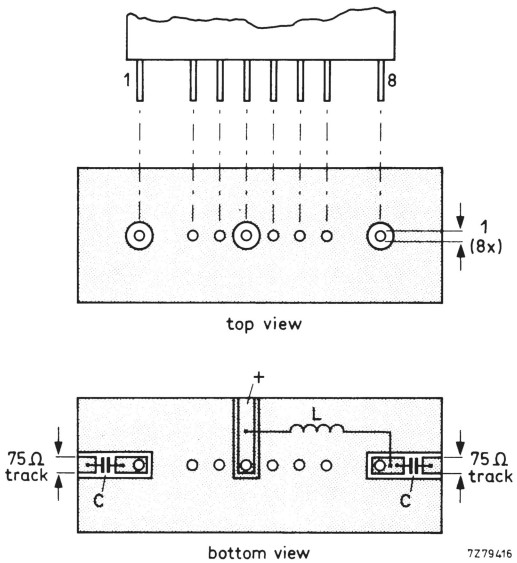
260 °C is the maximum permissible temperature of the solder; it must not be in contact with the joint for more than 5 seconds. The total contact time of successive solder waves must not exceed 5 seconds. The device may be mounted against the printed-circuit board, but the temperature of the device must not exceed 125 °C. If the printed-circuit board has been pre-heated, forced cooling may be necessary immediately after soldering to keep the temperature below the allowable limit.

Mounting recommendations

The module should preferably be mounted on double-sided printed-circuit board, see the example shown below.

Input and output should be connected to 75 Ω tracks.

The connections to the 'common' pins should be as close to the seating plane as possible.



L > 5 μH; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core (material 4B1; catalogue number 3122 104 91110) with a diameter of 1,6 mm.
C > 220 pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

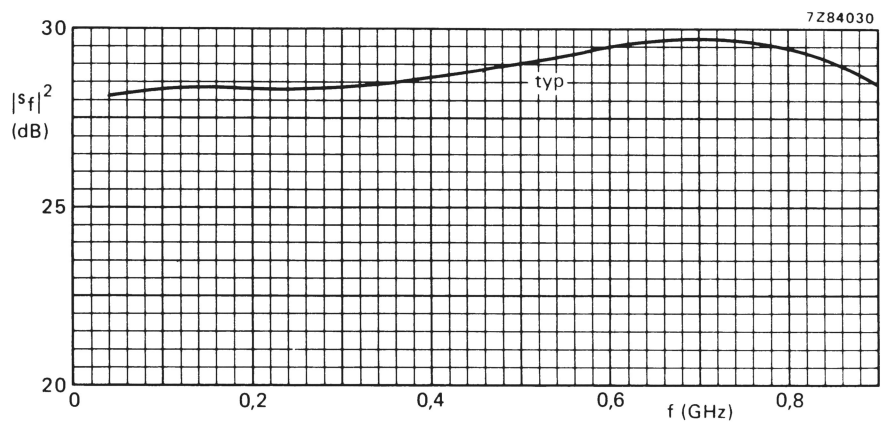


Fig. 4 Transducer gain as a function of frequency; Z_o = 75 Ω.

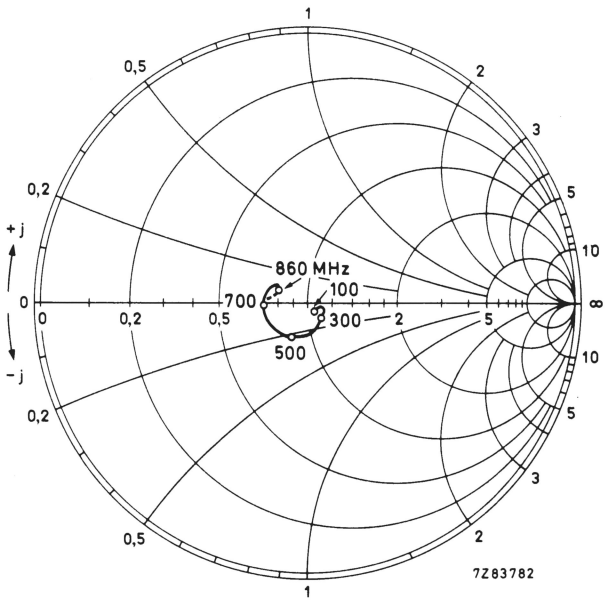


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

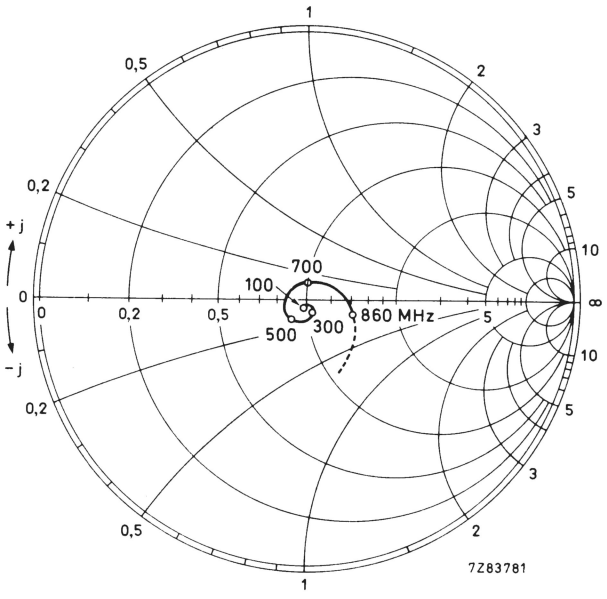


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

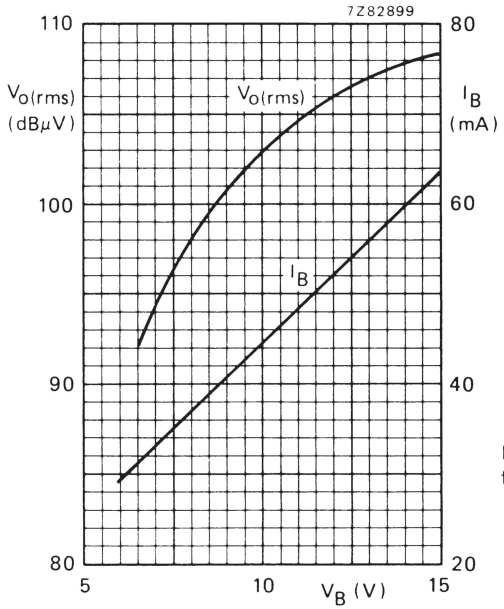


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

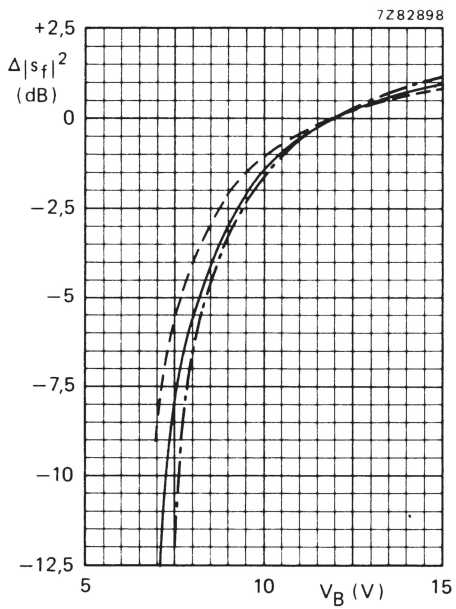


Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
–·–·– f = 860 MHz;
typical values.

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QUICK REFERENCE DATA

Frequency range	f		40 to 860	MHz
Source and load (characteristic) impedance	$R_s = R_\ell = Z_o$	=	75	Ω
Transducer gain	$G_{tr} = \lvert s_{fl} \rvert^2$	typ.	28	dB
Flatness of frequency response	$\pm\Delta\lvert s_{fl} \rvert^2$	typ.	1	dB
Output voltage at –60 dB intermodulation distortion (DIN 45004, 3-tone)				
VHF	$V_{o(rms)}$	typ.	113	dBμV
UHF	$V_{o(rms)}$	typ.	112	dBμV
Noise figure	F	typ.	7	dB
D.C. supply voltage	V_B	=	12	V ± 10%
Operating ambient temperature	T_{amb}		–20 to +70	°C

ENCAPSULATION 9-pin, in-line, resin-coated body, see MECHANICAL DATA (Fig.2)

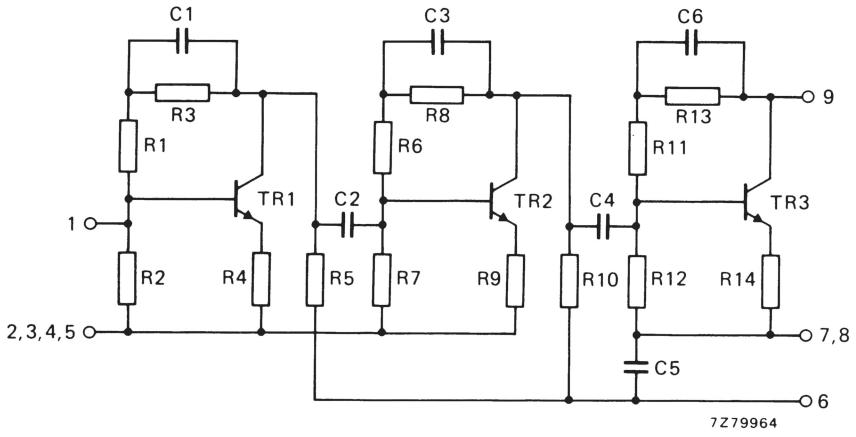

Fig. 1 Circuit diagram.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Operating ambient temperature	T_{amb}		−20 to +70 °C
Storage temperature	T_{stg}		−40 to +125 °C
D.C. supply voltage	V_B	max.	15 V
Peak incident powers on pins 1 and 8	P_{I1M}, P_{I8M}	max.	100 mW

CHARACTERISTICS

Measuring conditions

Ambient temperature	T_{amb}	=	25 °C
D.C. supply voltage	V_B	=	12 V
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω
Characteristic impedance of h.f. connections	Z_o	=	75 Ω
Frequency range	f	=	40 to 860 MHz

Performance

Supply current	I_B	typ.	105 mA
Transducer gain	$G_{tr} = \lvert s_f \rvert^2$	typ.	28 dB 26 to 31 dB
Flatness of frequency response	$\pm\Delta\lvert s_f \rvert^2$	typ.	1 dB
Individual maximum v.s.w.r.			
input	$VSWR_{(i)}$	typ.	2,3 *
output	$VSWR_{(o)}$	typ.	1,9 *
Back attenuation			
f = 100 MHz	$\lvert s_r \rvert^2$	typ.	45 dB
f = 860 MHz	$\lvert s_r \rvert^2$	typ.	35 dB
Output voltage at −60 dB intermodulation distortion (DIN 45004, par. 6,3; 3-tone)			
VHF	$V_{o(rms)}$	>	111 dBμV
		typ.	113 dBμV
UHF	$V_{o(rms)}$	>	110 dBμV
		typ.	112 dBμV
Noise figure	F	typ.	7 dB

s-parameters:	$s_f = s_{21}$	$s_i = s_{11}$
	$s_r = s_{12}$	$s_o = s_{22}$

* Highest value, for a sample, occurring in the frequency range.

OPERATING CONDITIONS

Ambient temperature range	T_{amb}		−20 to +70 °C
D.C. supply voltage	V_B	=	12 V ± 10%
Frequency range	f		40 to 860 MHz
Source impedance and load impedance	R_s, R_ℓ	=	75 Ω

MECHANICAL DATA

Dimensions in mm

The device is resin coated.

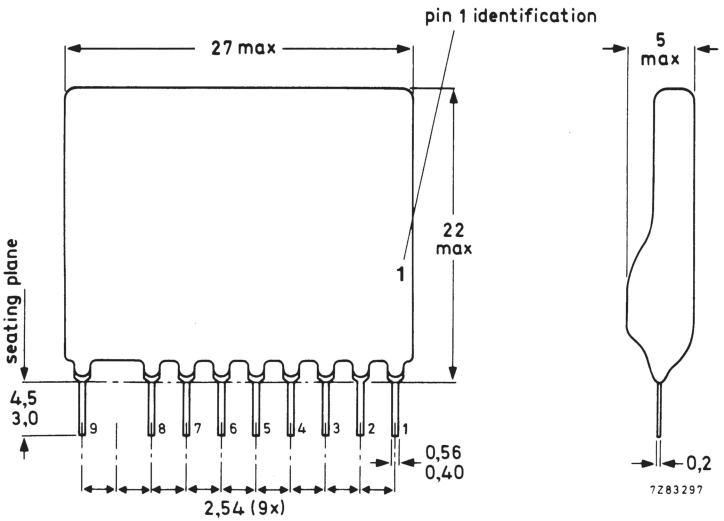

Fig. 2 Encapsulation.

Terminal connections

1	= input
2, 3, 4, 5 and 7, 8	= common
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9	= output/supply (+)

Soldering recommendations

Hand soldering

Maximum contact time for a soldering-iron temperature of 260 °C up to the seating plane is 5 s.

Dip or wave soldering

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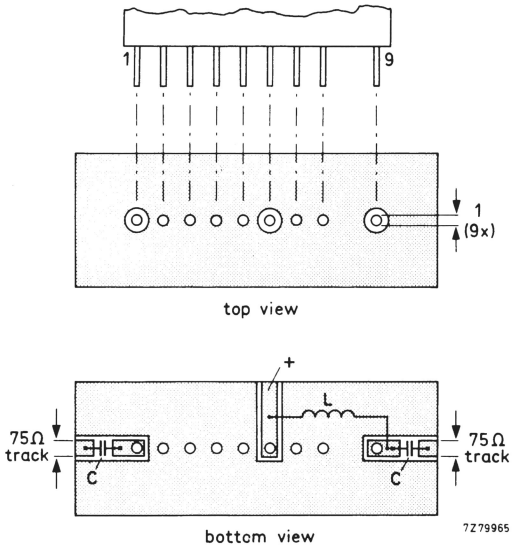


$L > 5\ \mu H$; e.g. catalogue no. 3122 108 20150 or 27 turns enamelled Cu wire (0,3 mm) wound on a ferrite core (material 4B1; catalogue no. 3122 104 91110) with a diameter of 1,6 mm.
$C > 220$ pF ceramic capacitor.

Fig. 3 Printed-circuit board holes and tracks.

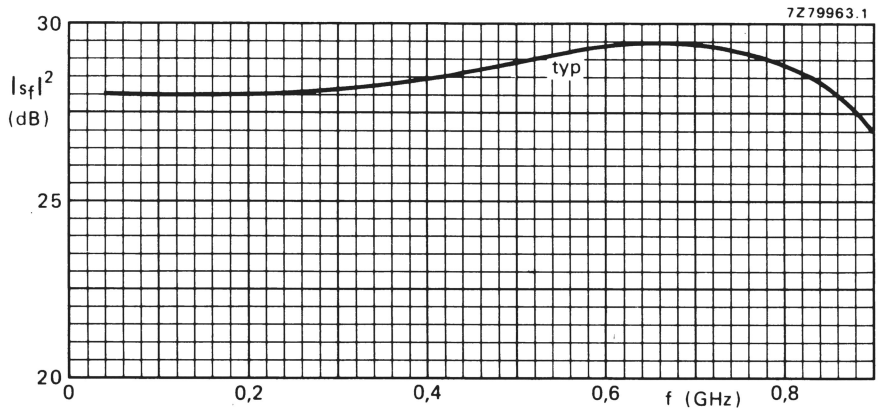


Fig. 4 Transducer gain as a function of frequency; $Z_o = 75\ \Omega$.

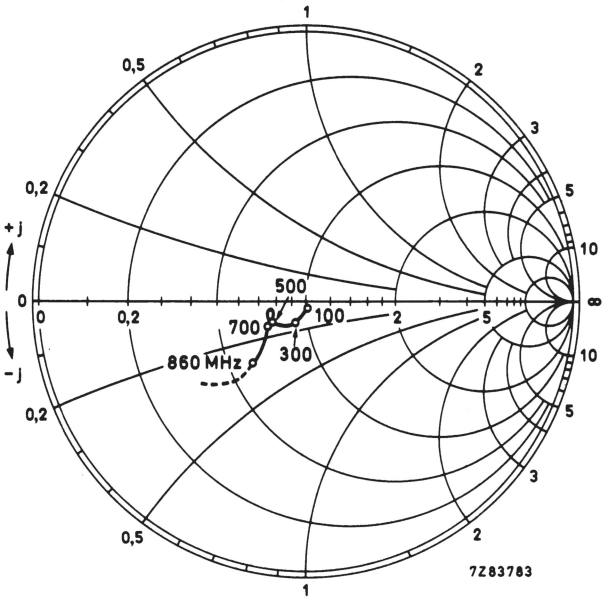


Fig. 5 Input impedance derived from input reflection coefficient s_i, co-ordinates in ohm x 75; typical values.

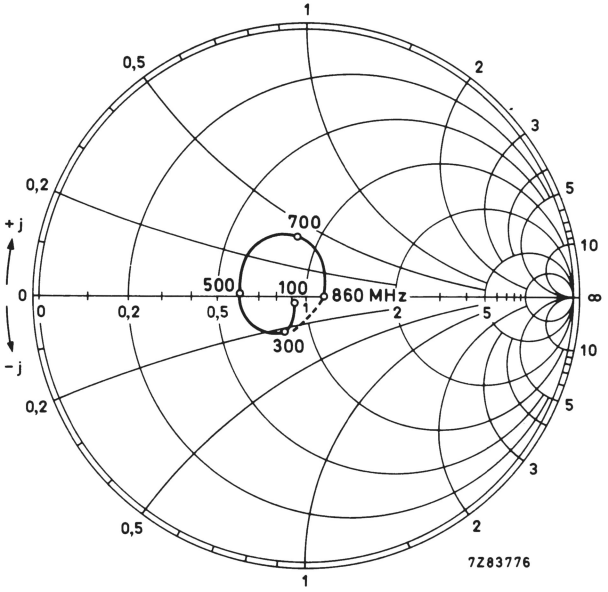


Fig. 6 Output impedance derived from output reflection coefficient s_o, co-ordinates in ohm x 75; typical values.

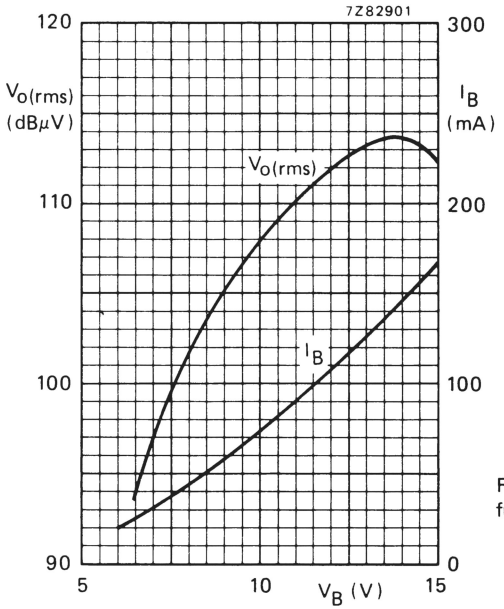


Fig. 7 Output voltage and supply current as a function of the supply voltage; typical values.

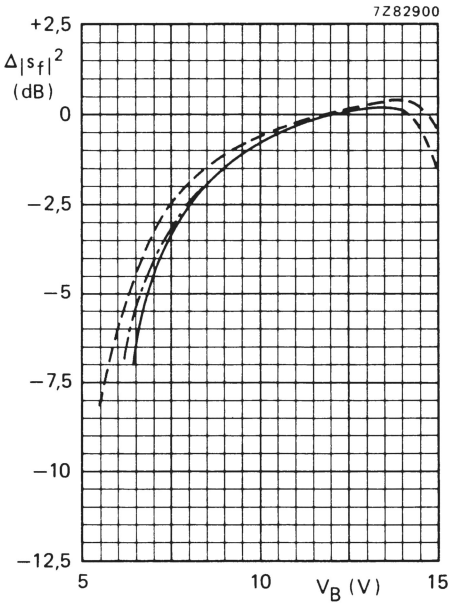
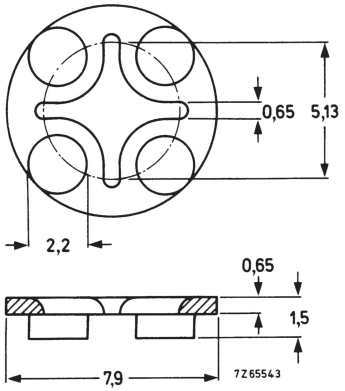


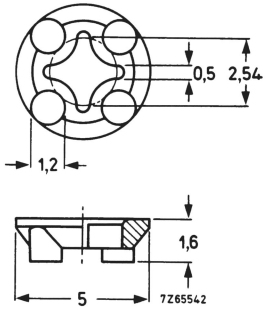
Fig. 8 Variation of transducer gain with supply voltage; reference 0 dB at 12 V;
——— f = 500 MHz;
– – – – f = 100 MHz;
—·—·— f = 860 MHz;
typical values.

MECHANICAL DATA

Dimensions in mm



Distance disc 56245 for TO-5 or TO-39; insulating material.

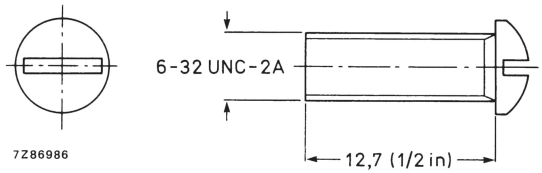


Distance disc 56246 for TO-18 or TO-72; insulating material.

Maximum permissible temperature: 100 °C.

ROUND HEAD SCREW 6-32 UNC-2A

Available, upon request, under type number 56396 or 12 NC code number 9390 298 10xx0.



INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV103	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAW56	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAW62	S1	SD
BA315	S1	Vrg	BAS56	S1	SD	BAX12	S1	SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAX14	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX18	S1	SD
BA318	S1	SD	BAT54	S1	SD	BAY80	S1	SD
BA423	S1	T	BAT74	S1	SD	BB112	S1	T
BA480	S1	T	BAT81	S1	T	BB119	S1	T
BA481	S1	T	BAT82	S1	T	BB130	S1	T
BA482	S1	T	BAT83	S1	T	BB204B	S1	T
BA483	S1	T	BAT85	S1	T	BB204G	S1	T
BA484	S1	T	BAT86	S1	T	BB212	S1	T
BA682	S1	T	BAV10	S1	SD	BB405B	S1	T
BA683	S1	T	BAV18	S1	SD	BB417	S1	T
BAS11	S1	SD	BAV19	S1	SD	BB809	S1	T
BAS15	S1	SD	BAV20	S1	SD	BB909A	S1	T
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB909B	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BBY31	S7/S1	Mm/T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BBY40	S7/S1	Mm/T
BAS20	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BC107	S3	Sm
BAS21	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD	BC108	S3	Sm
BAS28	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD	BC109	S3	Sm

Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes
Sm = Small-signal transistors

type no.	book	section	type no.	book	section	type no.	book	section
BC140	S3	Sm	BC818	S7	Mm	BCX51	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX52	S7	Mm
BC146	S3	Sm	BC847	S7	Mm	BCX53	S7	Mm
BC160	S3	Sm	BC848	S7	Mm	BCX54	S7	Mm
BC161	S3	Sm	BC849	S7	Mm	BCX55	S7	Mm
BC177	S3	Sm	BC850	S7	Mm	BCX56	S7	Mm
BC178	S3	Sm	BC856	S7	Mm	BCX68	S7	Mm
BC179	S3	Sm	BC857	S7	Mm	BCX69	S7	mm
BC200	S3	Sm	BC858	S7	Mm	BCX70*	S7	Mm
BC264A	S5	FET	BC859	S7	Mm	BCX71*	S7	Mm
BC264B	S5	FET	BC860	S7	Mm	BCY56	S3	Sm
BC264C	S5	FET	BC868	S7	Mm	BCY57	S3	Sm
BC264D	S5	FET	BC869	S7	Mm	BCY58	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY59	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY70	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY71	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY72	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY78	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BCY79	S3	Sm
BC375	S3	Sm	BCV61	S7	Mm	BCY87	S3	Sm
BC376	S3	Sm	BCV62	S7	Mm	BCY88	S3	Sm
BC546	S3	Sm	BCV71;R	S7	Mm	BCY89	S3	Sm
BC547	S3	Sm	BCV72;R	S7	Mm	BD131	S4a	P
BC548	S3	Sm	BCW29;R	S7	Mm	BD132	S4a	P
BC549	S3	Sm	BCW30;R	S7	Mm	BD135	S4a	P
BC550	S3	Sm	BCW31;R	S7	Mm	BD136	S4a	P
BC556	S3	Sm	BCW32;R	S7	Mm	BD137	S4a	P
BC557	S3	Sm	BCW33;R	S7	Mm	BD138	S4a	P
BC558	S3	Sm	BCW60*	S7	Mm	BD139	S4a	P
BC559	S3	Sm	BCW61*	S7	Mm	BD140	S4a	P
BC560	S3	Sm	BCW69;R	S7	Mm	BD201	S4a	P
BC635	S3	Sm	BCW70;R	S7	Mm	BD202	S4a	P
BC636	S3	Sm	BCW71;R	S7	Mm	BD203	S4a	P
BC637	S3	Sm	BCW72;R	S7	Mm	BD204	S4a	P
BC638	S3	Sm	BCW81;R	S7	Mm	BD226	S4a	P
BC639	S3	Sm	BCW89;R	S7	Mm	BD227	S4a	P
BC640	S3	Sm	BCX17;R	S7	Mm	BD228	S4a	P
BC807	S7	Mm	BCX18;R	S7	Mm	BD229	S4a	P
BC808	S7	Mm	BCX19;R	S7	Mm	BD230	S4a	P
BC817	S7	Mm	BCX20;R	S7	Mm	BD231	S4a	P

* = series
FET = Field-effect transistors
Mm = Microminiature semicondcutors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors

type no.	book	section	type no.	book	section	type no.	book	section
BD233	S4a	P	BD433	S4a	P	BD843	S4a	P
BD234	S4a	P	BD434	S4a	P	BD844	S4a	P
BD235	S4a	P	BD435	S4a	P	BD845	S4a	P
BD236	S4a	P	BD436	S4a	P	BD846	S4a	P
BD237	S4a	P	BD437	S4a	P	BD847	S4a	P
BD238	S4a	P	BD438	S4a	P	BD848	S4a	P
BD239	S4a	P	BD645	S4a	P	BD849	S4a	P
BD239A	S4a	P	BD646	S4a	P	BD850	S4a	P
BD239B	S4a	P	BD647	S4a	P	BD933	S4a	P
BD239C	S4a	P	BD648	S4a	P	BD934	S4a	P
BD240	S4a	P	BD649	S4a	P	BD935	S4a	P
BD240A	S4a	P	BD650	S4a	P	BD936	S4a	P
BD240B	S4a	P	BD651	S4a	P	BD937	S4a	P
BD240C	S4a	P	BD652	S4a	P	BD938	S4a	P
BD241	S4a	P	BD675	S4a	P	BD939	S4a	P
BD241A	S4a	P	BD676	S4a	P	BD940	S4a	P
BD241B	S4a	P	BD677	S4a	P	BD941	S4a	P
BD241C	S4a	P	BD678	S4a	P	BD942	S4a	P
BD242	S4a	P	BD679	S4a	P	BD943	S4a	P
BD242A	S4a	P	BD680	S4a	P	BD944	S4a	P
BD242B	S4a	P	BD681	S4a	P	BD945	S4a	P
BD242C	S4a	P	BD682	S4a	P	BD946	S4a	P
BD243	S4a	P	BD683	S4a	P	BD947	S4a	P
BD243A	S4a	P	BD684	S4a	P	BD948	S4a	P
BD243B	S4a	P	BD813	S4a	P	BD949	S4a	P
BD243C	S4a	P	BD814	S4a	P	BD950	S4a	P
BD244	S4a	P	BD815	S4a	P	BD951	S4a	P
BD244A	S4a	P	BD816	S4a	P	BD952	S4a	P
BD244B	S4a	P	BD817	S4a	P	BD953	S4a	P
BD244C	S4a	P	BD818	S4a	P	BD954	S4a	P
BD329	S4a	P	BD825	S4a	P	BD955	S4a	P
BD330	S4a	P	BD826	S4a	P	BD956	S4a	P
BD331	S4a	P	BD827	S4a	P	BDT20	S4a	P
BD332	S4a	P	BD828	S4a	P	BDT21	S4a	P
BD333	S4a	P	BD829	S4a	P	BDT29	S4a	P
BD334	S4a	P	BD830	S4a	P	BDT29A	S4a	P
BD335	S4a	P	BD839	S4a	P	BDT29B	S4a	P
BD336	S4a	P	BD840	S4a	P	BDT29C	S4a	P
BD337	S4a	P	BD841	S4a	P	BDT30	S4a	P
BD338	S4a	P	BD842	S4a	P	BDT30A	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDT30B	S4a	P	BDT65B	S4a	P	BDX43	S4a	P
BDT30C	S4a	P	BDT65C	S4a	P	BDX44	S4a	P
BDT31	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT31A	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT31B	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT31C	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT32	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT32A	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT32B	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT32C	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT41	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P
BDT41A	S4a	P	BDV64C	S4a	P	BDX63B	S4a	P
BDT41B	S4a	P	BDV65	S4a	P	BDX63C	S4a	P
BDT41C	S4a	P	BDV65A	S4a	P	BDX64	S4a	P
BDT42	S4a	P	BDV65B	S4a	P	BDX64A	S4a	P
BDT42A	S4a	P	BDV65C	S4a	P	BDX64B	S4a	P
BDT42B	S4a	P	BDV66A	S4a	P	BDX64C	S4a	P
BDT42C	S4a	P	BDV66B	S4a	P	BDX65	S4a	P
BDT60	S4a	P	BDV66C	S4a	P	BDX65A	S4a	P
BDT60A	S4a	P	BDV66D	S4a	P	BDX65B	S4a	P
BDT60B	S4a	P	BDV67A	S4a	P	BDX65C	S4a	P
BDT60C	S4a	P	BDV67B	S4a	P	BDX66	S4a	P
BDT61	S4a	P	BDV67C	S4a	P	BDX66A	S4a	P
BDT61A	S4a	P	BDV67D	S4a	P	BDX66B	S4a	P
BDT61B	S4a	P	BDV91	S4a	P	BDX66C	S4a	P
BDT61C	S4a	P	BDV92	S4a	P	BDX67	S4a	P
BDT62	S4a	P	BDV93	S4a	P	BDX67A	S4a	P
BDT62A	S4a	P	BDV94	S4a	P	BDX67B	S4a	P
BDT62B	S4a	P	BDV95	S4a	P	BDX67C	S4a	P
BDT62C	S4a	P	BDV96	S4a	P	BDX68	S4a	P
BDT63	S4a	P	BDW55	S4a	P	BDX68A	S4a	P
BDT63A	S4a	P	BDW56	S4a	P	BDX68B	S4a	P
BDT63B	S4a	P	BDW57	S4a	P	BDX68C	S4a	P
BDT63C	S4a	P	BDW58	S4a	P	BDX69	S4a	P
BDT64	S4a	P	BDW59	S4a	P	BDX69A	S4a	P
BDT64A	S4a	P	BDW60	S4a	P	BDX69B	S4a	P
BDT64B	S4a	P	BDX35	S4a	P	BDX69C	S4a	P
BDT64C	S4a	P	BDX36	S4a	P	BDX77	S4a	P
BDT65	S4a	P	BDX37	S4a	P	BDX78	S4a	P
BDT65A	S4a	P	BDX42	S4a	P	BDX91	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX92	S4a	P	BF471	S4b	HVP	BF960	S5	FET
BDX93	S4a	P	BF472	S4b	HVP	BF964	S5	FET
BDX94	S4a	P	BF483	S3	Sm	BF966	S5	FET
BDX95	S4a	P	BF485	S3	Sm	BF967	S3	Sm
BDX96	S4a	P	BF487	S3	Sm	BF970	S3	Sm
BDY90	S4a	P	BF494	S3	Sm	BF979	S3	Sm
BDY90A	S4a	P	BF495	S3	Sm	BF980	S5	FET
BDY91	S4a	P	BF496	S3	Sm	BF981	S5	FET
BDY92	S4a	P	BF510	S7/S5	Mm/FET	BF982	S5	FET
BF198	S3	Sm	BF511	S7/S5	Mm/FET	BF989	S7/S5	Mm/FET
BF199	S3	Sm	BF512	S7/S5	Mm/FET	BF990	S7/S5	Mm/FET
BF240	S3	Sm	BF513	S7/S5	Mm/FET	BF991	S7/S5	Mm/FET
BF241	S3	Sm	BF536	S7	Mm	BF992	S7/S5	Mm/FET
BF245A	S5	FET	BF550;R	S7	Mm	BF994	S7/S5	Mm/FET
BF245B	S5	FET	BF569	S7	Mm	BF996	S7/S5	Mm/FET
BF245C	S5	FET	BF579	S7	Mm	BFG23	S10	WBT
BF247A	S5	FET	BF620	S7	Mm	BFG32	S10	WBT
BF247B	S5	FET	BF621	S7	Mm	BFG34	S10	WBT
BF247C	S5	FET	BF622	S7	Mm	BFG51	S10	WBT
BF256A	S5	FET	BF623	S7	Mm	BFG65	S10	WBT
BF256B	S5	FET	BF660;R	S7	Mm	BFG90A	S10	WBT
BF256C	S5	FET	BF689K	S10	WBT	BFG91A	S10	WBT
BF324	S3	Sm	BF763	S10	WBT	BFG96	S10	WBT
BF370	S3	Sm	BF767	S7	Mm	BFP90A	S10	WBT
BF410A	S5	FET	BF819	S4b	HVP	BFP91A	S10	WBT
BF410B	S5	FET	BF820	S7	Mm	BFP96	S10	WBT
BF410C	S5	FET	BF821	S7	Mm	BFQ10	S5	FET
BF410D	S5	FET	BF822	S7	Mm	BFQ11	S5	FET
BF419	S4b	HVP	BF823	S7	Mm	BFQ12	S5	FET
BF420	S3	Sm	BF824	S7	Mm	BFQ13	S5	FET
BF421	S3	Sm	BF857	S4b	HVP	BFQ14	S5	FET
BF422	S3	Sm	BF858	S4b	HVP	BFQ15	S5	FET
BF423	S3	Sm	BF859	S4b	HVP	BFQ16	S5	FET
BF450	S3	Sm	BF869	S4b	HVP	BFQ17	S7	Mm
BF451	S3	Sm	BF870	S4b	HVP	BFQ18A	S7	Mm
BF457	S4b	HVP	BF871	S4b	HVP	BFQ19	S7	Mm
BF458	S4b	HVP	BF872	S4b	HVP	BFQ22S	S10	WBT
BF459	S4b	HVP	BF926	S3	Sm	BFQ23	S10	WBT
BF469	S4b	HVP	BF936	S3	Sm	BFQ23C	S10	WBT
BF470	S4b	HVP	BF939	S3	Sm	BFQ24	S10	WBT

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors
WBT = Wideband hybrid IC transistors

type no.	book	section
BFQ32	S10	WBT
BFQ32C	S10	WBT
BFQ32S	S10	WBT
BFQ33	S10	WBT
BFQ34	S10	WBT
BFQ34T	S10	WBT
BFQ42	S6	RFP
BFQ43	S6	RFP
BFQ51	S10	WBT
BFQ51C	S10	WBT
BFQ52	S10	WBT
BFQ53	S10	WBT
BFQ63	S10	WBT
BFQ65	S10	WBT
BFQ66	S10	WBT
BFQ68	S10	WBT
BFQ136	S10	WBT
BFR29	S5	FET
BFR30	S7/S5	Mm/FET
BFR31	S7/S5	Mm/FET
BFR49	S10	WBT
BFR53;R	S7	Mm
BFR54	S3	Sm
BFR64	S10	WBT
BFR65	S10	WBT
BFR84	S5	FET
BFR90	S10	WBT
BFR90A	S10	WBT
BFR91	S10	WBT
BFR91A	S10	WBT
BFR92;R	S7	Mm
BFR92A;R	S7	Mm
BFR93;R	S7	Mm
BFR93A;R	S7	Mm
BFR94	S10	WBT
BFR95	S10	WBT
BFR96	S10	WBT
BFR96S	S10	WBT
BFR101A;B	S7/S5	Mm/FET
BFS17;R	S7	Mm
BFS18;R	S7	Mm
BFS19;R	S7	Mm
BFS20;R	S7	Mm
BFS21	S5	FET
BFS21A	S5	FET
BFS22A	S6	RFP
BFS23A	S6	RFP
BFT24	S10	WBT
BFT25;R	S7	Mm
BFT44	S3	Sm
BFT45	S3	Sm
BFT46	S7/S5	Mm/FET
BFT92;R	S7	Mm
BFT93;R	S7	Mm
BFW10	S5	FET
BFW11	S5	FET
BFW12	S5	FET
BFW13	S5	FET
BFW16A	S10	WBT
BFW17A	S10	WBT
BFW30	S10	WBT
BFW61	S5	FET
BFW92	S10	WBT
BFW92A	S10	WBT
BFW93	S10	WBT
BFX29	S3	Sm
BFX30	S3	Sm
BFX34	S3	Sm
BFX84	S3	Sm
BFX85	S3	Sm
BFX86	S3	Sm
BFX87	S3	Sm
BFX88	S3	Sm
BFX89	S10	WBT
BFY50	S3	Sm
BFY51	S3	Sm
BFY52	S3	Sm
BFY55	S3	Sm
BFY90	S10	WBT
BG2000	S1	RT
BG2097	S1	RT
BGD102	S10	WBM
BGD102E	S10	WBM
BGD104	S10	WBM
BGD104E	S10	WBM
BGX11*	S2b	ThM
BGX12*	S2b	ThM
BGX13*	S2b	ThM
BGX14*	S2b	ThM
BGX15*	S2b	ThM
BGX17*	S2b	ThM
BGX25	S2a	ThM
BGY22	S6	RFP
BGY22A	S6	RFP
BGY23	S6	RFP
BGY23A	S6	RFP
BGY32	S6	RFP
BGY33	S6	RFP
BGY35	S6	RFP
BGY36	S6	RFP
BGY40A	S6	RFP
BGY40B	S6	RFP
BGY41A	S6	RFP
BGY41B	S6	RFP
BGY43	S6	RFP
BGY45A	S6	RFP
BGY45B	S6	RFP
BGY46A	S6	RFP
BGY46B	S6	RFP
BGY47*	S6	RFP
BGY50	S10	WBM
BGY51	S10	WBM
BGY52	S10	WBM
BGY53	S10	WBM
BGY54	S10	WBM
BGY55	S10	WBM
BGY56	S10	WBM
BGY57	S10	WBM
BGY58	S10	WBM
BGY58A	S10	WBM

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
ThM = Thyristor modules
WBM = Wideband hybrid IC modules
WBT = Wideband hybrid IC transistors

type no.	book	section	type no.	book	section	type no.	book	section
BGY59	S10	WBM	BLV37	S6	RFP	BLW96	S6	RFP
BGY60	S10	WBM	BLV45/12	S6	RFP	BLW97	S6	RFP
BGY61	S10	WBM	BLV57	S6	RFP	BLW98	S6	RFP
BGY65	S10	WBM	BLV59	S6	RFP	BLW99	S6	RFP
BGY67	S10	WBM	BLV75/12	S6	RFP	BLX13	S6	RFP
BGY67A	S10	WBM	BLV80/28	S6	RFP	BLX13C	S6	RFP
BGY70	S10	WBM	BLV90	S6	RFP	BLX14	S6	RFP
BGY71	S10	WBM	BLV91	S6	RFP	BLX15	S6	RFP
BGY74	S10	WBM	BLV92	S6	RFP	BLX39	S6	RFP
BGY75	S10	WBM	BLV93	S6	RFP	BLX65	S6	RFP
BGY84	S10	WBM	BLV94	S6	RFP	BLX65E	S6	RFP
BGY84A	S10	WBM	BLV95	S6	RFP	BLX67	S6	RFP
BGY85	S10	WBM	BLV96	S6	RFP	BLX68	S6	RFP
BGY85A	S10	WBM	BLV97	S6	RFP	BLX69A	S6	RFP
BGY93A	S6	RFP	BLV98	S6	RFP	BLX91A	S6	RFP
BGY93B	S6	RFP	BLV99	S6	RFP	BLX91CB	S6	RFP
BGY93C	S6	RFP	BLW29	S6	RFP	BLX92A	S6	RFP
BLU20/12	S6	RFP	BLW31	S6	RFP	BLX93A	S6	RFP
BLU30/12	S6	RFP	BLW32	S6	RFP	BLX94A	S6	RFP
BLU45/12	S6	RFP	BLW33	S6	RFP	BLX94C	S6	RFP
BLU50	S6	RFP	BLW34	S6	RFP	BLX95	S6	RFP
BLU51	S6	RFP	BLW50F	S6	RFP	BLX96	S6	RFP
BLU52	S6	RFP	BLW60	S6	RFP	BLX97	S6	RFP
BLU53	S6	RFP	BLW60C	S6	RFP	BLX98	S6	RFP
BLU60/12	S6	RFP	BLW76	S6	RFP	BLY85	S6	RFP
BLU97	S6	RFP	BLW77	S6	RFP	BLY87A	S6	RFP
BLU98	S6	RFP	BLW78	S6	RFP	BLY87C	S6	RFP
BLU99	S6	RFP	BLW79	S6	RFP	BLY88A	S6	RFP
BLV10	S6	RFP	BLW80	S6	RFP	BLY88C	S6	RFP
BLV11	S6	RFP	BLW81	S6	RFP	BLY89A	S6	RFP
BLV20	S6	RFP	BLW82	S6	RFP	BLY89C	S6	RFP
BLV21	S6	RFP	BLW83	S6	RFP	BLY90	S6	RFP
BLV25	S6	RFP	BLW84	S6	RFP	BLY91A	S6	RFP
BLV30	S6	RFP	BLW85	S6	RFP	BLY91C	S6	RFP
BLV30/12	S6	RFP	BLW86	S6	RFP	BLY92A	S6	RFP
BLV31	S6	RFP	BLW87	S6	RFP	BLY92C	S6	RFP
BLV32F	S6	RFP	BLW89	S6	RFP	BLY93A	S6	RFP
BLV33	S6	RFP	BLW90	S6	RFP	BLY93C	S6	RFP
BLV33F	S6	RFP	BLW91	S6	RFP	BLY94	S6	RFP
BLV36	S6	RFP	BLW95	S6	RFP	BLY97	S6	RFP

RFP = R.F. power transistors and modules
WBM = Wideband hybrid IC modules

type no.	book	section	type no.	book	section	type no.	book	section
BPF10	S8	PDT	BSR33	S7	Mm	BST80	S5	FET
BPF24	S8	PDT	BSR40	S7	Mm	BST82	S5	FET
BPW22A	S8	PDT	BSR41	S7	Mm	BST84	S5	FET
BPW50	S8	PDT	BSR42	S7	Mm	BST86	S5	FET
BPX25	S8	PDT	BSR43	S7	Mm	BST90	S5	FET
BPX29	S8	PDT	BSR50	S3	Sm	BST97	S5	FET
BPX40	S8	PDT	BSR51	S3	Sm	BST100	S5	FET
BPX41	S8	PDT	BSR52	S3	Sm	BST110	S5	FET
BPX42	S8	PDT	BSR56	S7/S5	Mm/FET	BST120	S5	FET
BPX71	S8	PDT	BSR57	S7/S5	Mm/FET	BST122	S5	FET
BPX72	S8	PDT	BSR58	S7/S5	Mm/FET	BSV15	S3	Sm
BPX95C	S8	PDT	BSR60	S3	Sm	BSV16	S3	Sm
BR100/03	S2b	Th	BSR61	S3	Sm	BSV17	S3	Sm
BR101	S3	Sm	BSR62	S3	Sm	BSV52;R	S7	Mm
BRY39	S3	Sm	BSS38	S3	Sm	BSV64	S3	Sm
BRY56	S3	Sm	BSS50	S3	Sm	BSV78	S5	FET
BRY61	S7	Mm	BSS51	S3	Sm	BSV79	S5	FET
BRY62	S7	Mm	BSS52	S3	Sm	BSV80	S5	FET
BS107	S5	FET	BSS60	S3	Sm	BSV81	S5	FET
BS170	S5	FET	BSS61	S3	Sm	BSW66A	S3	Sm
BSD10	S5	FET	BSS62	S3	Sm	BSW67A	S3	Sm
BSD12	S5	FET	BSS63;R	S7	Mm	BSW68A	S3	Sm
BSD20	S5/7	FET	BSS64;R	S7	Mm	BSX19	S3	Sm
BSD22	S5/7	FET	BSS68	S3	Sm	BSX20	S3	Sm
BSD212	S5	FET	BSS83	S5/7	FET/Mm	BSX45	S3	Sm
BSD213	S5	FET	BST15	S7	Mm	BSX46	S3	Sm
BSD214	S5	FET	BST16	S7	Mm	BSX47	S3	Sm
BSD215	S5	FET	BST39	S7	Mm	BSX59	S3	Sm
BSR12;R	S7	Mm	BST40	S7	Mm	BSX60	S3	Sm
BSR13;R	S7	Mm	BST50	S7	Mm	BSX61	S3	Sm
BSR14;R	S7	Mm	BST51	S7	Mm	BSY95A	S3	Sm
BSR15;R	S7	Mm	BST52	S7	Mm	BT136*	S2b	Tri
BSR16;R	S7	Mm	BST60	S7	Mm	BT137*	S2b	Tri
BSR17;R	S7	Mm	BST61	S7	Mm	BT138*	S2b	Tri
BSR17A;R	S7	Mm	BST62	S7	Mm	BT139*	S2b	Tri
BSR18;R	S7	Mm	BST70A	S5	FET	BT149*	S2b	Th
BSR18A;R	S7	Mm	BST72A	S5	FET	BT151*	S2b	Th
BSR30	S7	Mm	BST74A	S5	FET	BT152*	S2b	Th
BSR31	S7	Mm	BST76A	S5	FET	BT153	S2b	Th
BSR32	S7	Mm	BST78	S5	FET	BT155*	S2b	Th

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
Sm = Small-signal transistors
PDT = Photodiodes or transistors
Th = Thyristors
Tri = Triacs

type no.	book	section	type no.	book	section	type no.	book	section
BT157*	S2b	Th	BUV83	S4b	SP	BUZ36	S9	PM
BTV24*	S2b	Th	BUV89	S4b	SP	BUZ40	S9	PM
BTV34*	S2b	Tri	BUW11;A	S4b	SP	BUZ41A	S9	PM
BTV58*	S2b	Th	BUW12;A	S4b	SP	BUZ42	S9	PM
BTV59*	S2b	Th	BUW13;A	S4b	SP	BUZ43	S9	PM
BTV60*	S2b	Th	BUW84	S4b	SP	BUZ44A	S9	PM
BTW23*	S2b	Th	BUW85	S4b	SP	BUZ45	S9	PM
BTW38*	S2b	Th	BUX46;A	S4b	SP	BUZ45A	S9	PM
BTW40*	S2b	Th	BUX47;A	S4b	SP	BUZ45B	S9	PM
BTW42*	S2b	Th	BUX48;A	S4b	SP	BUZ45C	S9	PM
BTW43*	S2b	Tri	BUX80	S4b	SP	BUZ46	S9	PM
BTW45*	S2b	Th	BUX81	S4b	SP	BUZ50A	S9	PM
BTW58*	S2b	Th	BUX82	S4b	SP	BUZ50B	S9	PM
BTW59*	S2b	Th	BUX83	S4b	SP	BUZ53A	S9	PM
BTW63*	S2b	Th	BUX84	S4b	SP	BUZ54	S9	PM
BTW92*	S2b	Th	BUX85	S4b	SP	BUZ54A	S9	PM
BTX18*	S2b	Th	BUX86	S4b	SP	BUZ60	S9	PM
BTX94*	S2b	Tri	BUX87	S4b	SP	BUZ60B	S9	PM
BTY79*	S2b	Th	BUX88	S4b	SP	BUZ63	S9	PM
BTY91*	S2b	Th	BUX90	S4b	SP	BUZ63B	S9	PM
BU208A	S4b	SP	BUX98	S4b	SP	BUZ64	S9	PM
BU208B	S4b	SP	BUX98A	S4b	SP	BUZ71	S9	PM
BU326	S4b	SP	BUY89	S4b	SP	BUZ71A	S9	PM
BU326A	S4b	SP	BUZ10	S9	PM	BUZ72	S9	PM
BU426	S4b	SP	BUZ10A	S9	PM	BUZ72A	S9	PM
BU426A	S4b	SP	BUZ11	S9	PM	BUZ73A	S9	PM
BU433	S4b	SP	BUZ11A	S9	PM	BUZ74	S9	PM
BU505	S4b	SP	BUZ14	S9	PM	BUZ74A	S9	PM
BU508A	S4b	SP	BUZ15	S9	PM	BUZ76	S9	PM
BU705	S4b	SP	BUZ20	S9	PM	BUZ76A	S9	PM
BU806	S4b	SP	BUZ21	S9	PM	BUZ80	S9	PM
BU807	S4b	SP	BUZ23	S9	PM	BUZ80A	S9	PM
BU824	S4b	SP	BUZ24	S9	PM	BUZ83	S9	PM
BU826	S4b	SP	BUZ25	S9	PM	BUZ83A	S9	PM
BUS11;A	S4b	SP	BUZ30	S9	PM	BUZ84	S9	PM
BUS12;A	S4b	SP	BUZ31	S9	PM	BUZ84A	S9	PM
BUS13;A	S4b	SP	BUZ32	S9	PM	BY228	S1	R
BUS14;A	S4b	SP	BUZ33	S9	PM	BY229*	S2a	R
BUT11;A	S4b	SP	BUZ34	S9	PM	BY249*	S2a	R
BUV82	S4b	SP	BUZ35	S9	PM	BY260*	S2a	R

* = series
PM = Power MOS transistors
R = Rectifier diodes
SP = Low-frequency switching power transistors
Th = Thyristors
Tri = Triacs

type no.	book	section	type no.	book	section	type no.	book	section
BY261*	S2a	R	BYV28*	S1/S2a	R	BYX46*	S2a	R
BY329*	S2a	R	BYV29*	S2a	R	BYX50*	S2a	R
BY359*	S2a	R	BYV30*	S2a	R	BYX52*	S2a	R
BY438	S1	R	BYV32*	S2a	R	BYX56*	S2a	R
BY448	S1	R	BYV33*	S2a	R	BYX90G	S1	R
BY458	S1	R	BYV34*	S2a	R	BYX94	S1	R
BY505	S1	R	BYV36*	S1	R	BYX96*	S2a	R
BY509	S1	R	BYV39*	S2a	R	BYX97*	S2a	R
BY527	S1	R	BYV42*	S2a	R	BYX98*	S2a	R
BY584	S1	R	BYV43*	S2a	R	BYX99*	S2a	R
BY588	S1	R	BYV72*	S2a	R	BZD23	S1	Vrg
BY609	S1	R	BYV73*	S2a	R	BZT03	S1	Vrg
BY610	S1	R	BYV79*	S2a	R	BZV10	S1	Vrf
BY614	S1	R	BYV92*	S2a	R	BZV11	S1	Vrf
BY619	S1	R	BYV95A	S1	R	BZV12	S1	Vrf
BY620	S1	R	BYV95B	S1	R	BZV13	S1	Vrf
BY707	S1	R	BYV95C	S1	R	BZV14	S1	Vrf
BY708	S1	R	BYV96D	S1	R	BZV37	S1	Vrf
BY709	S1	R	BYV96E	S1	R	BZV46	S1	Vrg
BY710	S1	R	BYW25*	S2a	R	BZV49*	S1/S7	Vrg/Mm
BY711	S1	R	BYW29*	S2a	R	BZV55*	S7	Mm
BY712	S1	R	BYW30*	S2a	R	BZV85*	S1	Vrg
BY713	S1	R	BYW31*	S2a	R	BZW03*	S1	Vrg
BY714	S1	R	BYW54	S1	R	BZW14	S1	Vrg
BYD13*	S1	R	BYW55	S1	R	BZW70*	S2a	TS
BYD33*	S1	R	BYW56	S1	R	BZW86*	S2a	TS
BYD73*	S1	R	BYW92*	S2a	R	BZW91*	S2a	TS
BYM56*	S1	R	BYW93*	S2a	R	BZX55*	S1	Vrg
BYQ28*	S2a	R	BYW94*	S2a	R	BZX70*	S2a	Vrg
BYR29*	S2a	R	BYW95A	S1	R	BZX75*	S1	Vrg
BYT79*	S2a	R	BYW95B	S1	R	BZX79*	S1	Vrg
BYV10	S1	R	BYW95C	S1	R	BZX84*	S7/S1	Mm/Vrg
BYV19*	S2a	R	BYW96D	S1	R	BZX90	S1	Vrf
BYV20*	S2a	R	BYW96E	S1	R	BZX91	S1	Vrf
BYV21*	S2a	R	BYX25*	S2a	R	BZX92	S1	Vrf
BYV22*	S2a	R	BYX30*	S2a	R	BZX93	S1	Vrf
BYV23*	S2a	R	BYX32*	S2a	R	BZX94	S1	Vrf
BYV24*	S2a	R	BYX38*	S2a	R	BZY91*	S2a	Vrg
BYV26*	S1	R	BYX39*	S2a	R	BZY93*	S2a	Vrg
BYV27*	S1/S2a	R	BYX42*	S2a	R	BZY95*	S2a	Vrg

* = series
Mm = Microminiature semiconductors for hybrid circuits
R = Rectifier diodes
TS = Transient suppressor diodes
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes

type no.	book	section	type no.	book	section	type no.	book	section
BZY96*	S2a	Vrg	CQV61A(L)	S8	LED	CQY89A	S8	LED
CNX21	S8	PhC	CQV62(L)	S8	LED	CQY94	S8	LED
CNX35	S8	PhC	CQV70(L)	S8	LED	CQY94B(L)	S8	LED
CNX36	S8	PhC	CQV70A(L)	S8	LED	CQY95B	S8	LED
CNX37	S8	PhC	CQV71A(L)	S8	LED	CQY96(L)	S8	LED
CNX38	S8	PhC	CQV72(L)	S8	LED	CQY97A	S8	LED
CNX44	S8	PhC	CQV80L	S8	LED	OM320	S10	WBM
CNX48	S8	PhC	CQV80AL	S8	LED	OM321	S10	WBM
CNX62	S8	PhC	CQV81L	S8	LED	OM322	S10	WBM
CNY50	S8	PhC	CQV82L	S8	LED	OM323	S10	WBM
CNY52	S8	PhC	CQW10(L)	S8	LED	OM323A	S10	WBM
CNY53	S8	PhC	CQW10A(L)	S8	LED	OM335	S10	WBM
CNY57	S8	PhC	CQW10B(L)	S8	LED	OM336	S10	WBM
CNY57A	S8	PhC	CQW11A(L)	S8	LED	OM337	S10	WBM
CNY62	S8	PhC	CQW11B(L)	S8	LED	OM337A	S10	WBM
CNY63	S8	PhC	CQW12(L)	S8	LED	OM339	S10	WBM
CQ209S	S8	D	CQW12B(L)	S8	LED	OM345	S10	WBM
CQ216X	S8	D	CQW20A	S8	LED	OM350	S10	WBM
CQ216Y	S8	D	CQW21	S8	LED	OM360	S10	WBM
CQ327;R	S8	D	CQW22	S8	LED	OM361	S10	WBM
CQ330;R	S8	D	CQW24(L)	S8	LED	OM370	S10	WBM
CQ331;R	S8	D	CQW54	S8	LED	OM931	S4a	P
CQ332;R	S8	D	CQX10	S8	LED	OM961	S4a	P
CQ427;R	S8	D	CQX11	S8	LED	OSB9110	S2a	St
CQ430;R	S8	D	CQX12	S8	LED	OSB9115	S2a	St
CQ431;R	S8	D	CQX24(L)	S8	LED	OSB9210	S2a	St
CQ432;R	S8	D	CQX51	S8	LED	OSB9215	S2a	St
CQF24	S8	Ph	CQX54(L)	S8	LED	OSB9410	S2a	St
CQL10A	S8	Ph	CQX64(L)	S8	LED	OSB9415	S2a	St
CQL13	S8	Ph	CQX74(L)	S8	LED	OSM9110	S2a	St
CQL13A	S8	Ph	CQX74Y	S8	LED	OSM9115	S2a	St
CQL14A	S8	Ph	CQY11B	S8	LED	OSM9210	S2a	St
CQL14B	S8	Ph	CQY11C	S8	LED	OSM9215	S2a	St
CQN10	S8	LED	CQY24B(L)	S8	LED	OSM9410	S2a	St
CQN11	S8	LED	CQY49B	S8	LED	OSM9415	S2a	St
CQT10	S8	LED	CQY49C	S8	LED	OSM9510	S2a	St
CQT11	S8	LED	CQY50	S8	LED	OSM9511	S2a	St
CQT12	S8	LED	CQY52	S8	LED	OSM9512	S2a	St
CQV60(L)	S8	LED	CQY54A	S8	LED	OSS9110	S2a	St
CQV60A(L)	S8	LED	CQY58A	S8	LED	OSS9115	S2a	St

* = series
D = Displays
LED = Light-emitting diodes
P = Low-frequency power transistors
Ph = Photoconductive devices
PhC = Photocouplers
St = Rectifier stacks
WBM = Wideband hybrid IC modules
Vrg = Voltage regulator diodes

type no.	book	section	type no.	book	section	type no.	book	section
OSS9210	S2a	St	1N3882	S2a	R	2N1711	S3	Sm
OSS9215	S2a	St	1N3883	S2a	R	2N1893	S3	Sm
OSS9410	S2a	St	1N3889	S2a	R	2N2219	S3	Sm
OSS9415	S2a	St	1N3890	S2a	R	2N2219A	S3	Sm
PBMF4391	S5	FET	1N3891	S2a	R	2N2222	S3	Sm
PBMF4392	S5	FET	1N3892	S2a	R	2N2222A	S3	Sm
PBMF4393	S5	FET	1N3893	S2a	R	2N2297	S3	Sm
PH2222;R	S3	Sm	1N3909	S2a	R	2N2368	S3	Sm
PH2222A;R	S3	Sm	1N3910	S2a	R	2N2369	S3	Sm
PH2369	S3	Sm	1N3911	S2a	R	2N2369A	S3	Sm
PH2907;R	S3	Sm	1N3912	S2a	R	2N2483	S3	Sm
PH2907A;R	S3	Sm	1N3913	S2a	R	2N2484	S3	Sm
PH2955T	S4a	P	1N4001G	S1	R	2N2904	S3	Sm
PH3055T	S4a	P	1N4002G	S1	R	2N2904A	S3	Sm
PH5415	S3	Sm	1N4003G	S1	R	2N2905	S3	Sm
PH5416	S3	Sm	1N4004G	S1	R	2N2905A	S3	Sm
PHSD51	S2a	R	1N4005G	S1	R	2N2906	S3	Sm
RPY58A	S8	Ph	1N4006G	S1	R	2N2906A	S3	Sm
RPY76B	S8	Ph	1N4007G	S1	R	2N2907	S3	Sm
RPY86	S8	I	1N4148	S1	SD	2N2907A	S3	Sm
RPY87	S8	I	1N4150	S1	SD	2N3019	S3	Sm
RPY88	S8	I	1N4151	S1	SD	2N3020	S3	Sm
RPY89	S8	I	1N4153	S1	SD	2N3053	S3	Sm
RPY90*	S8	I	1N4446	S1	SD	2N3375	S6	RFP
RPY91*	S8	I	1N4448	S1	SD	2N3553	S6	RFP
RPY93	S8	I	1N4531	S1	SD	2N3632	S6	RFP
RPY94	S8	I	1N4532	S1	SD	2N3822	S5	FET
RPY95	S8	I	1N5059	S1	R	2N3823	S5	FET
RPY96	S8	I	1N5060	S1	R	2N3866	S6	RFP
RPY97	S8	I	1N5061	S1	R	2N3903	S3	Sm
1N821;A	S1	Vrf	1N5062	S1	R	2N3904	S3	Sm
1N823;A	S1	Vrf	1N5832	S2a	R	2N3905	S3	Sm
1N825;A	S1	Vrf	1N5833	S2a	R	2N3906	S3	Sm
1N827;A	S1	Vrf	1N5834	S2a	R	2N3924	S6	RFP
1N829;A	S1	Vrf	1N6097	S2a	R	2N3926	S6	RFP
1N914	S1	SD	1N6098	S2a	R	2N3927	S6	RFP
1N916	S1	SD	2N918	S10	WBT	2N3966	S5	FET
1N3879	S2a	R	2N929	S3	Sm	2N4030	S3	Sm
1N3880	S2a	R	2N930	S3	Sm	2N4031	S3	Sm
1N3881	S2a	R	2N1613	S3	Sm	2N4032	S3	Sm

* = series
FET = Field-effect transistors
I = Infrared devices
P = Low-frequency power transistors
Ph = Photoconductive devices
R = Rectifier diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
St = Rectifier stacks
Vrf = Voltage reference diodes
WBT = Wideband hybrid IC transistors

type no.	book	section	type no.	book	section	type no.	book	section
2N4033	S3	Sm	2N5415	S3	Sm	56352	S4b	A
2N4091	S5	FET	2N5416	S3	Sm	56353	S4b	A
2N4092	S5	FET	2N5550	S3	Sm	56354	S4b	A
2N4093	S5	FET	2N5551	S3	Sm	56359b	S2,4b	A
2N4123	S3	Sm	2N6659	S5	FET	56359c	S2,4b	A
2N4124	S3	Sm	2N6660	S5	FET	56359d	S2,4b	A
2N4125	S3	Sm	2N6661	S5	FET	56360a	S2,4b	A
2N4126	S3	Sm	61SV	S8	I	56363	S2,4b	A
2N4391	S5	FET	375CQY/B	S8	Ph	56364	S2,4b	A
2N4392	S5	FET	497CQF/A	S8	Ph	56367	S2a/b	A
2N4393	S5	FET	498CQL	S8	Ph	56368a	S2,4b	A
2N4427	S6	RFP	56201d	S4b	A	56368b	S2,4b	A
2N4856	S5	FET	56201j	S4b	A	56369	S2,4b	A
2N4857	S5	FET	56245	S3,10	A	56378	S2,4b	A
2N4858	S5	FET	56246	S3,10	A	56379	S2,4b	A
2N4859	S5	FET	56261a	S4b	A	56387a,b	S4b	A
2N4860	S5	FET	56264a,b	S2a/b	A			
2N4861	S5	FET	56295	S2a/b	A			
2N5400	S3	Sm	56326	S4b	A			
2N5401	S3	Sm	56339	S4b	A			

A = Accessories
FET = Field-effect transistors
I = Infrared devices
Ph = Photoconductive devices
RFP = R.F. power transistors and modules
Sm = Small-signal transistors

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